

The AMSAT[®] Journal



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Volume 32, Number 4

July/August 2009



AL1EN at Field Day!



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Too**

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AMSAT Announcements

AMSAT-UK Colloquium Videos

The videos of the presentations at this year's successful AMSAT-UK Colloquium in Guildford are now available to watch on the British Amateur Television Club (BATC) Web site. Among the fascinating video presentations are:

- FUNcube, the New AMSAT-UK Linear Transponder Satellite Project by Graham Shirville, G3VZV
- AMSAT-NA Update by Drew Glasbrenner, KO4MA
- AMSAT-DL Update by Peter Guelzow, DB2OS
- Electronics and Teddy Bears: A Near-Space Adventure by Ed Moore, MOTEK, and Fergus Noble, MONBL, Cambridge University
- Engineers Wanted! Tempting Teenagers to Explore Technology by Garry Bulmer, Software Architect
- Medium Earth Orbits by David Bowman, GOMRF

All 18 videos can be seen at <http://www.batc.tv/> Click on the "Film Archive" icon on the left to see all the videos available then select the video you wish to see (they start with 2009 AMSAT). To see the video full screen click on the icon at the bottom of the video player. PDFs of the slides from the presentations can be found on the AMSAT-UK Web site at:

http://www.uk.amsat.org/component/option,com_wrapper/Itemid,278/

Thanks to the BATC for recording and editing the videos (a time consuming job) as well providing this invaluable video service at batc.tv for the amateur satellite community. 🌐

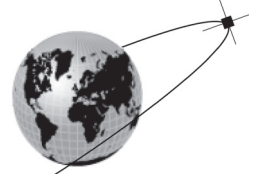
AMSAT's Mission

AMSAT is a non-profit volunteer organization which designs, builds and operates experimental satellites and promotes space education. We work in partnership with government, industry, educational institutions and fellow Amateur Radio societies. We encourage technical and scientific innovation, and promote the training and development of skilled satellite and ground system designers and operators.

AMSAT's Vision

Our Vision is to deploy satellite systems with the goal of providing wide-area and continuous coverage. AMSAT will continue active participation in human space missions and support a stream of LEO satellites developed in cooperation with the educational community and other amateur satellite groups.





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The AMSAT Journal (ISSN: 1407-3076) is published bi-monthly (Jan/Feb, Mar/Apr, May/Jun, Jul/Aug, Sep/Oct, Nov/Dec) by AMSAT-NA, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703. Telephone: 301-589-6062, fax: 301-608-3410. Periodicals postage paid at Silver Spring, MD and additional mailing offices.

Postmaster: Send address changes to *The AMSAT Journal*, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703.

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Since I submitted the May/June Apogee View to *AMSAT Journal* Editor Ed Long, WA4SWJ, a number of significant events have taken place.

ARISSat-1

In July AMSAT was informed that the surplus Orlan space suits on the International Space Station, one of which was being held for use as the space frame for SuitSat-2, were removed from the ISS. This action was taken due to safety and storage constraints on the ISS as crew manning was being increased from three to six members (13 at one time during crew exchange). This doubling of crew size meant that items not needed had to be discarded to make room for items required to support a larger crew size.

Significantly, the scheduled upload of SuitSat-2 components that were to be placed in the Orlan suit has not been cancelled, nor has the EVA to release SuitSat-2 been changed to remove that activity. From an Energia perspective, the SuitSat-2 project is still on the ISS schedule.

With the loss of the Orlan suit, an alternative space frame is needed. Bob Davis, KF4KSS, and a team of mechanical engineers have designed a new frame that takes into account the SuitSat-2 electronics, the Russian supplied battery and the size of the solar panels that was to be mounted on the spacesuit, creating a roughly 20"x20"x11" satellite. Consequently, the team has been challenged to complete the electronics originally designed for placement in an Orlan space suit as well as design and build a space frame and slightly modify the mechanical aspects of the electronics to properly fit within the new mechanical design. Further, all of this work must be completed and shipped to Energia by Thanksgiving to make the January 2010 upload to the ISS on a Progress cargo vessel. Clearly, the pressure on our satellite builders has been markedly increased with these additional challenges.

The removal of the spacesuit from this project certainly reduces the PR pizzazz that ARISS and the Amateur Radio community enjoyed with SuitSat-1. However, this revision fits well within AMSAT's longer-range goals of creating small payloads that might be released from the ISS in the future. In essence, this change allows AMSAT to do the engineering work now to develop a baseline deployable satellite for future ISS releases that could feature other educational payloads as well as extensive Amateur

Radio communications suites prototyped in SuitSat-2. As AMSAT develops new technologies, these developments could be incorporated into future projects for test and evaluation. The current project will also incorporate an experiment developed by Russia's Kursk State University that will measure the vacuum of space as the satellite slowly approaches the Earth's outer atmosphere.

With this change in the physical configuration of SuitSat-2, the ARISS delegates voted on August 19 to change the name of the project to ARISSat-1. AMSAT is building ARISSat-1 under the auspices of ARISS, which accepted the flight opportunity offered by Energia.

From an AMSAT perspective, ARISSat-1 offers significant opportunities as a flying test bed, such as flying the first Software Defined Transponder (SDX) as well as new transmitter and receiver boards that might be adapted to future projects with larger power budgets and higher orbits. Along with providing new satellite capabilities for satellite operators, ARISSat-1 has a primary goal of educational outreach much as SuitSat-1 was designed to fulfill. Clearly, ARISSat-1 is a significant project that has a major impact on future AMSAT engineering projects. The beauty of using ISS satellite releases for technology demonstrations is due to their low cost to AMSAT, the relative frequency of flights (potentially, every few years) and the low risk to AMSAT in the event of satellite failure. NASA and Energia are looking for reliable spacecraft operation for educational outreach, so our ability to take technological risks is tempered by the need to support the goals of those providing the flight opportunities.

Just as noteworthy, ARISS is being given an opportunity to upload mass to the ISS via a Progress cargo vessel and have the ARISSat-1 released during an EVA (Extra-Vehicular Activity) at no cost to the Amateur Radio community, as these will be borne by the space agencies. AMSAT's costs are centered upon the design and construction of the hardware (including the new space frame) plus using volunteer labor to not only design and build the spacecraft but also handle the documentation needed for

continued on page 19 ...



A Lightweight, Low Power, Satellite Tracking System for Portable Operation

by Dave Matthews, KI4PSR, dave@lostfrogs.com

This article describes a battery powered azimuth and elevation antenna positioner using inexpensive hobby servo motors and gearboxes. The purpose of the project was to build a simple and portable antenna rotator system for Field Day and camping use. The tracking system



Photo 1: System overview.

concept was to utilize small beam antennas for UHF/VHF satellite communications like those offered by Arrow and Elk, to automatically track Amateur Radio satellites. The original design goal was to mount a pair of small Yagis on a boom like a scaled down version of a traditional UHF/VHF Yagi pair for satellite use. As it turns out, the elevation motor/gear assembly chosen for this first attempt will only support one antenna, but the system still serves to demonstrate the concept. The reason for an automatic



Photo 2: Rotator assembly.

tracking system for portable operation rather than manual hand held antenna pointing was to allow me to concentrate on the rigs and the QSO, as I intended to work SSB birds as well as the FM satellites.

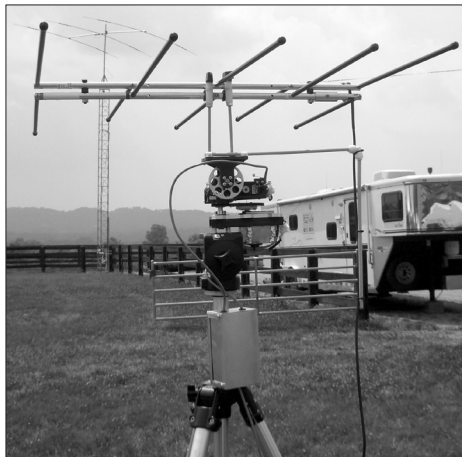


Photo 3: Antenna and rotator deployed at Field Day. (Photo by Rey Venegas, KJ4LNL)

The Hardware

The elevation rotator uses a ServoCity.com 'Standard Servo Power Gearbox' and a HiTech HS-7955TG servo motor. The azimuth rotator uses a ServoCity.com 'HS-805/815BB Servo Power Gearbox' and a HS-815BB servo motor. The rotators were assembled using the instructions included with the gearboxes, the azimuth gearbox modified to permit 360 degree rotation. During testing and program development, the elevation rotator often went to its limit of travel, with enough torque to shear teeth off of the gears! So metal gears replaced the stock nylon gears, and end-stop limit switches were added.

I mounted the rotator assembly on a sturdy Bogen tripod meant for heavy video camera use. With a compass and a level I can position the rotator assembly for magnetic north and horizontal positions. The control box I made has a few pushbuttons for manual



Photo 4: Station overview front view.

operation, for example to park the antenna or test the system range of motion.

The Software

The servo motors are controlled by a Parallax 'Board of Education' development board holding a BS-2 Basic Stamp. In addition, a Parallax 'ServoPAL' is used to refresh the servos so they will hold position while the BS-2 processor is busy receiving position commands. I used the Parallax Serial LCD model #27977 to display operator prompts

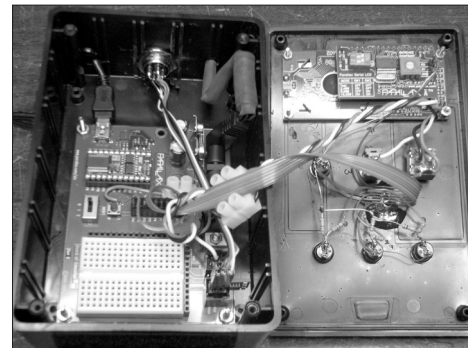


Photo 5: Rotator control box interior.

and show current azimuth and elevation positions. The servo motors use 6V power, so I built a small regulator assembly to reduce the 12V rig power to 6V.

The BS-2 processor receives position



Photo 6: Station overview top view.

commands from the rotator control program built into Ham Radio Deluxe (HRD). I chose the Alpha Spid output from HRD, and the BS-2 program extracts the position information from a serial data stream sent by HRD. HRD does all of the satellite rotator control as well as the uplink and downlink rig frequency control.

The Mobile Platform

For this first attempt I used a borrowed Icom 706MKIIG rig for the downlink receiver (thanks to A14VP for the loan), and an ICOM 7000 rig that I bought in a fit of irresponsible extravagance for the uplink transmitter. I installed the rigs along with UHF and VHF



Photo 7: Field Day visitors observing satellite tracking demonstration.
(Photo by Craig Lamb, N4BAX)

preamps, duplexers and a laptop computer on a mobile platform made from a firewood hauling cart. A 24AH 12V battery and a 30A power supply were mounted to allow use with or without 120V AC power. PowerPole connectors and a Rig Runner 4005 distribute power to the various components and to two cooling fans.



Photo 8: Working a pass at Field Day. (Photo by KJ4LNL)

Performance

Initially the system worked well until I transmitted! That caused the azimuth position to jump as much as 45 degrees out of position. Since I had to abandon a boom and the isolating distance that would have provided, the antenna and servo motors are in very close proximity. I used ferrite beads, capacitors and shielding to reduce motor disturbance to an acceptable level.

These hobby servo motors are adequate for this application, but they have a good bit of deadband and backlash slop. The entire assembly will shake a bit while moving or when hit by a gust of wind. While the appearance looks unsteady, the result is perfectly acceptable tracking accuracy given the antenna's beam width.

Prior to use on Field Day I was able to make one SSB contact from my front yard. Then

the weather became too hot and I decided not to attempt further contacts or practice. That was an unfortunate mistake; I needed more experience with the system than I thought!

On Field Day I participated with our local ARES group in Williamson County TN (www.wcares.org). I was able to demonstrate

the satellite tracking system and software a few times, and the demonstrations were well received. We had many visitors at the site, and they all seemed to enjoy the antenna pointing at a satellite moving across the sky, and observing the HRD display on the laptop monitor.

Unfortunately I made no QSOs due to operator errors and other confusions. (I



Photo 9: Moving to the next demonstration location. (Photo by N4BAX)

could have used more practice with the equipment!) We heard some other operators and QSOs and that was exciting enough for everyone (except for me). Still it was an overall Field Day success from the public information/education standpoint.

Evaluation

While this system works well as a first attempt, I plan to improve it immediately. The first change will be to revamp the elevation servo system to allow the cross



Photo 10: Satellite station mascot, AL1EN.
(Photo by N4BAX)

beam and dual antenna configuration I had initially planned. This will reduce the need for at least one of the duplexers, and will increase the isolation from the servo motors and hopefully improve my ability to hear my downlink. So more power to the elevation rotator is a priority.

I will consider using dual polarized Yagis (UHF and VHF) with polarization switching as part of the control system mounted on the cart.

An audio distribution system to headphones and recorder is vital. With the crowds around the station at Field Day, and the other ambient noises associated with the Field Day activity, it was nearly impossible to copy and tune SSB contacts.

Many thanks to my Elmer Alan (Alan Biddle, WA4SCA) for his continuing help and support of my efforts in satellite communications! 🌐



Photo 11: KI4PSR preparing for a Field Day demonstration. (Photo by N4BAX)

Program listing next page ...



```

' {$STAMP BS2}
' {$PBASIC 2.5}

' -----[ I/O Definitions ]-----
portin  CON  16      'Define serial input port
TX      PIN  0      ' serial output to LCD
Start   PIN  1      ' start tracking pushbutton
Park    PIN  2      ' move to park pushbutton
Cycle   PIN  3      ' run a test cycle pushbutton
Alarm   PIN  13     'Define the ServoPal alarm pin.
nInp    PIN  12

T600     CON  1646    'Baud rate

LcdBkSpC CON  $08     ' move cursor left
LcdRt    CON  $09     ' move cursor right
LcdLF    CON  $0A     ' move cursor down 1 line
LcdCls   CON  $0C     ' clear LCD (use PAUSE 5 after)
LcdCR    CON  $0D     ' move pos 0 of next line
LcdBLon  CON  $11     ' backlight on
LcdBLOff CON  $12     ' backlight off
LcdOff   CON  $15     ' LCD off
LcdOn1   CON  $16     ' LCD on; cursor off, blink off
LcdOn2   CON  $17     ' LCD on; cursor off, blink on
LcdOn3   CON  $18     ' LCD on; cursor on, blink off
LcdOn4   CON  $19     ' LCD on; cursor on, blink on
LcdLine1 CON  $80     ' move to line 1, column 0
LcdLine2 CON  $94     ' move to line 2, column 0

```

```

x  VAR Word
azdata VAR Word
eldata VAR Word
Oldazpos VAR Word
Azpos  VAR Word
Elpos  VAR Word
baudout VAR Word      ' baud rate for Serial LCD
baudin  VAR Word      ' baud rate for Serial Input

```

```

' -----[ Initialization ]-----

```

```

Reset:
HIGH TX      ' setup TX pin for LCD
INPUT Start
INPUT Park
INPUT Cycle
PAUSE 100    ' allow LCD to initialize

```

```

Restart:      'ServoPal init
INPUT nInp 'Make sure nInp isn't being driven.
DO UNTIL nInp 'Wait for ServoPAL to power up.
LOOP
LOW nInp 'Set pin to an output and hold it low
PAUSE 100 ' for 100mS.
HIGH nInp 'Raise the pin.

```

```

baudout = T19K2
baudin  = T600
Oldazpos = 1180
azpos = 1180

```

```

' -----[ Program Code ]-----

```

Main:

```

SEROUT TX, baudout, [LcdOn1, LcdCls, LcdBLon] ' cursor off
SEROUT TX, baudout, [LcdLine1,"Waiting For a"]
SEROUT TX, baudout, [LcdLine2,"Button Press"]

```

DO

```

IF Park THEN
GOSUB ParkIt
ENDIF

```

```

IF Cycle THEN
GOSUB CycleTest
ENDIF

```

LOOP UNTIL Start = 1

RUN:

```

SEROUT TX, baudout, [LcdOn4, LcdCls] ' blinking cursor
SEROUT TX, baudout, [LcdLine1,"Waiting For "]
SEROUT TX, baudout, [LcdLine2,"Serial Data", LcdRT,LcdRT,LcdRT,
LcdRT,LcdLF]

```

Running:

```

'DEBUGIN DEC azdata, DEC eldata

```

```

SERIN portin,baudin, [WAIT ("W"),DEC4 azdata, DEC4 eldata]
IF (azdata >= 360) AND (azdata <= 720) THEN
azdata = azdata - 360
ELSEIF (azdata > 720) THEN
azdata = azdata - 720
ENDIF
eldata = eldata - 360
GOSUB Track
GOTO Running

```

END

Track:

```

SEROUT TX, baudout,[LcdLine1,"Azimuth = ", DEC3 azdata]
SEROUT TX, baudout,[LcdLine2,"Elevation = ", DEC2 eldata]
SEROUT TX, baudout,[LcdLF,LcdRT]
OldAzpos = Azpos ' save previous azimuth position for large
excursion rotation handling
Azpos = (11800 - (azdata * 23))/10
Elpos = ((eldata * 45) + 7160) / 10
'DEBUG DEC Azpos," ", DEC Elpos, CR

```

```

' verify signals are within servo limits

```

```

IF (Azpos < 350) AND (Azpos > 1180) THEN
Azpos = 2 ' skip this servo
ENDIF

```

```

IF (Elpos < 716) AND (Elpos > 1126) THEN
Elpos = 2
ENDIF

```

```

'DEBUG "AZ", DEC Azpos, " ",CR
'DEBUG "EL", DEC Elpos, " ",CR

```

```

' look for rapid excursion and increment it instead

```

```

'DEBUG " abs = ",DEC (ABS (OldAzpos - Azpos)), CR
IF ABS ((OldAzpos - Azpos) > 10) THEN
GOSUB LargeExcursion
ELSE
PULSOUT nInp, Azpos
PULSOUT nInp, Elpos
ENDIF

```


RETURN

ParkIt:

```
azdata = 0
eldata = 0
GOSUB Track
RETURN
```

CycleTest:

```
GOSUB ParkIt
PAUSE 50
```

```
FOR azdata = 1 TO 360
  eldata = azdata / 4
  GOSUB Track
NEXT
```

```
FOR azdata = 360 TO 1
  eldata = azdata / 4
  GOSUB Track
NEXT
```

```
GOSUB ParkIt
```

RETURN

LargeExcursion:

```
' DEBUG "large!", CR
' DEBUG "old", DEC Oldazpos,
"new", DEC Azpos, CR
FOR x = OldAzpos TO Azpos
  ' DEBUG DEC x, CR
  PULSOUT nInp, x
  PULSOUT nInp, Elpos
  PAUSE 20
NEXT
' DEBUG "done", CR
RETURN
```



Andrew Koenig, KE5GDB, (right) recipient of the 2009 Young Ham Of The Year Award. He is active on the satellites and you may have followed his discussions on the AMSAT-BB e-mail reflector, or seen his Web site <http://www.thathamkid.com>. He spent some time visiting with us before stopping to visit with Ted Randall, WB8PUM, in the next booth. During Andrew's interview on Ted's QSO radio show (<http://www.tedrandall.com>), he answered many questions about AMSAT and really did a great job promoting the many aspects of this fascinating hobby. Tom, W5KUB, (white shirt, standing) Webcast the Huntsville hamfest, including the interview with Andrew. Replays are available at <http://www.w5kub.com>.



Alan, WA4SCA, was down from Nashville to help out. He's joined here by WB5RMG's daughter, Shelby Sieg.



Alan Sieg, WB5RMG, and Tim Cunningham, N8DEU, staffed the AMSAT booth at the Huntsville Alabama hamfest. Alan said, "We collected a few renewals and sold most of what we had the first day. But the fun part for me is talking to everyone". Tim also presented a forum on satellite operations with handheld equipment.

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Field Day Results by Bruce Paige, KK5DO, kk5do@amsat.org

Another year, another Field Day and again more fun in the sun (or rain). We had an increase in activity. Three more stations operated this year than last year, but not as many as in 2006 (well, one less). With FO-29 being brought back to life, it was actually the favored satellite. It carried both voice and CW QSO's. There were also several stations that worked the ISS. I determined the number of satellites by mode. Thus, VO-52 in voice and CW would make two satellites.

	2006	2007	2008	2009
Satellites	7	5	8	11
QSO's	258	207	220	328
Stations	21	13	17	20

Okay, cutting to the chase. Here is what you have been waiting for. The number one station in the emergency power category is the Northern Ohio DX Association, using the call W8DXA with a total of 73 points. They swatted The Houston MosQRPitos, using the call W5MSQ, out of first with W5MSQ falling to fourth place with 54 points missing third by a mere mosquito.

Holding on to second place from last year is the Lafayette DX Association, W9LDX, with 64.



In the photo at left at the controls of W9LDX were Steve, N9IP, (R) and Steve, W9TN, (L).

In third place is last year's 7th place holder, the Oakland County Amateur Radio Society, using the call W8TNO with a total of 55 points.

Our top home station running on commercial power was once again Jim, W6ASL, with 15 points.

There were 11 satellites used this year with a total of 328 QSO's completed. This year FO-29 carried most of the QSO's with 104 phone and 28 CW, VO-52 with 67 phone and 12 CW while AO-7 carried 54 phone and 38 CW. On the FM satellites, AO-51 carried 10 QSO's with only 1 station reporting contacts on both transponders. FO-29 carried the most phone contacts followed by VO-52 and AO-7.



To the left is a view of the Northern Ohio DX Association Field Day site lined with lots of RF gathering pine trees. Their tent can be seen on the left of the picture. Below right are their satellite antennas (and heavy duty rotor?).

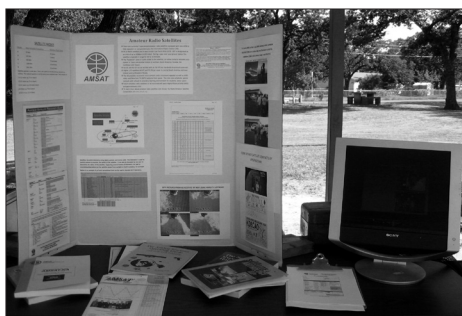
Andrew, KA3AGT, operating for the Vienna Wireless Society, using the call K4XY, spent most of his time giving demonstrations using his HT and Arrow antenna rather than trying to punch through the pile ups.

Jim, K8ZZU, who was operating for our third place winning team, W9LDX, had been on vacation only a week and a half

earlier in the Yukon. He was lucky to snag John, VE8EV, on FO-29 from his vacation spot. Go figure.

Below left is Bob, WD5ILB, as he was operating for the Tri County Amateur Radio Club, N0JY. Looks like he was in the shade and loving it. Below center is their public service display.

Only five contacts were reported with the ISS. One of those was from the W4G Field Day site where the Athens (GA) Amateur Radio Club and the Northeast Georgia Amateur Radio Club joined operations. The clubs had a mobile rig with a 2 meter vertical set up to provide the local "talk in" to the Field Day site, and I had them tune it to 145.800. As the ISS pass began, there were 5-6 radios beside mine listening



on the downlink. The folks with HTs were absolutely shocked at the clear copy they had as Robert, VA3CSA, worked stations coming down the east coast. And at 9:26 local time, I was blessed and fortunate to put W4G into the ISS Field Day log. When Robert asked W4G to call again, the entire site got quiet. I called him and gave our report. He responded with his, and I transmitted a QSL and Godspeed from W4G. When he responded with, "QSL

... W4G ... thank you ... QRZ?" The entire Field Day site burst into celebration. "Showing all those folks that they could talk to an astronaut in orbit using a fully portable, emergency-powered station with a handheld antenna was very gratifying" said Tim, N3TL.

There were plenty of pictures submitted this year and they all could not be placed in this article. But fear not, our editor will happily pop a few of them into future issues of the *Journal*.

Next year, I hope that we have even more participants in the AMSAT Field Day. Hopefully, Murphy will not visit your Field Day site. But if he does, be prepared.

73 and Good DX,

Bruce, KK5DO

Here is a table of all entries received. In the case of a tie in the contacts, the call signs are listed alphabetically.

1	W8DXA	73	2A Emerg
2	W9LDX	64	1A Emerg
3	W8TNO	55	3A Emerg
4	W5MSQ	54	3A Emerg
5	K0GQ	33	2A Emerg
6	K5AXW	28	1AB Emerg
7	N0JY	26	2A Emerg
8	W4G	24	7A Emerg
9	K4CQ	21	2A Emerg
10	W9LJ	21	2A Emerg
11	W5IU	19	4A Emerg
12	W0MA	18	2F Emerg
13	W6ASL	15	1D Home
14	W1BRS	11	10F Emerg
15	K9MOT	7	2A Emerg
16	K2IRT	6	3A Comm
17	K6OTH	2	1D Home
18	K4XY	1	4A Emerg
19	N0N	1	2A Emerg
20	WB8CQR	1	2A Emerg



K9MOT

K5AXW



K5AXW



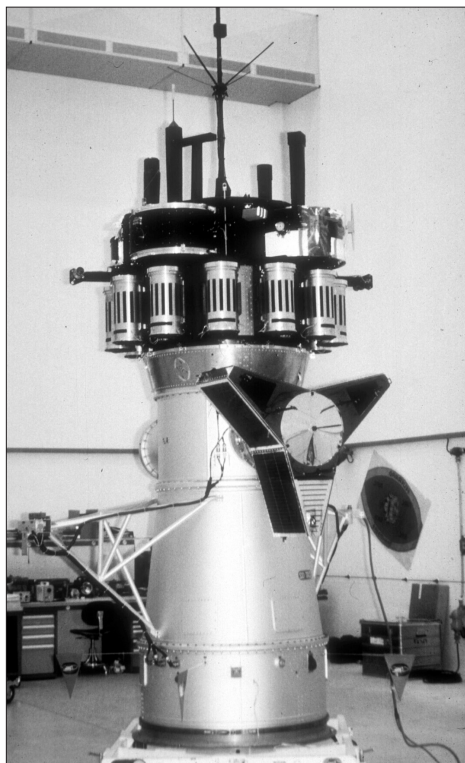
AMSAT - The Second Decade, Part 2

by Dick Daniels, W4PUJ, w4puj@amsat.org

The second half of the second decade proved just as exciting and rewarding as the first.

New Publications

The December 1984 issue of *Orbit* magazine was its last. At the beginning of 1985 it was replaced with a new less costly, publication, *AMSAT Satellite Journal – Journal for the Amateur Radio Space Program* with Harold Winard, KB2M, continuing as editor. The *AMSAT Satellite Report* continued but was re-titled to, *Amateur Satellite Report* subtitled, *AMSAT's Newsletter for the Amateur Space Program*. This combination held for a little over a year when the *AMSAT Satellite Journal* was discontinued as a cost-saving measure leaving *AMSAT Satellite Report* as the primary general news publication until 1989. In May of that year



Phase IIIA mounted.

The *AMSAT Journal* became, and still is, AMSAT's Journal.

More Hams in Space and a GAS Can

A year and a half after Owen Garriott's flight, a second shuttle was in space. The July 29, 1985 launch of Space Shuttle 51-F, carried Tony England, W0ORE, and he was better equipped with a more sophisticated station. The Shuttle Amateur Radio Experiment (SAREX-1) provided both 2 m voice and SSTV. During the mission Tony found



Microsats on ASAP.

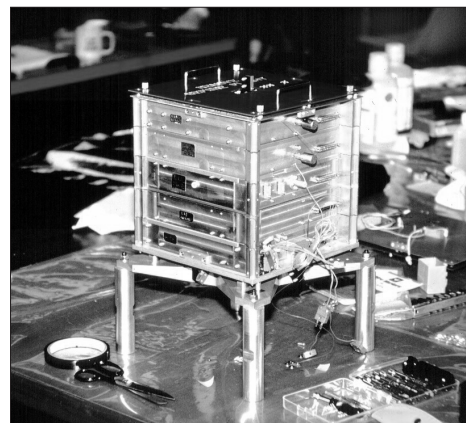
sufficient time to transmit a number of slow scan images and conduct a large number of QSOs worldwide. NASA had asked for an assessment of the impact of SAREX back on Earth. The wealth of very positive publicity strengthened the relationship between AMSAT and NASA that resulted in approving an ongoing program.

Early in 1985 rumors were that the German Spacelab D-1 scheduled to fly on Shuttle Mission 61-A would carry a ham radio station. During the mission that began October 30, active amateur communications did take place, but most took place over Europe. Learning that rocket pioneer Dr. Hermann Oberth would be in Washington, DC area during the mission, Bill Tynan arranged for him to visit the Goddard Space Flight Center and the AMSAT Lab with the hope that a voice contact with the crew on Spacelab D-1 could be arranged. But Bill was not able to arrange for the Shuttle Mission Cap-Com to alert the German crew to be on the air at the right time, so the contact didn't come off during Dr. Oberth's visit. Dr. Oberth did visit the Lab but unfortunately the contact didn't work out.

While not a Ham in Space activity, a group of hams at the Marshall Space Flight Center, led by Ed Stuka, W4QAU, did organize to support an experiment to be carried in a Getaway Special Canister in the bay of Space Shuttle 61-C scheduled to fly in late 1985. The flight took place in January 1986 and

synthesized voice reports of the conditions of several experiments in the payload were transmitted directly to Earth in the amateur 70 cm band and relayed through the Mode B transponder on AO-10. Again, good press for the Amateur Radio space program.

Rewarding his strong support for the manned space initiatives and the need for oversight, the AMSAT Board of Directors (BoD), at the Vail, Colorado fall annual meeting, appointed Bill Tynan Vice President for



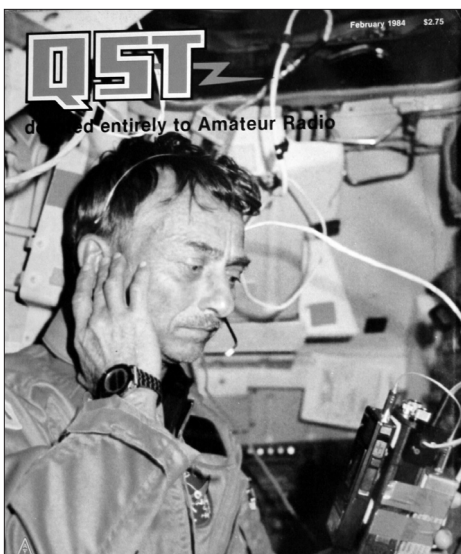
Microsats, the stack.

Manned Space.

Beginning to Think Past Phase 3C

At the Vail Symposium reports were presented on the good progress being made on a Phase IIIC development. Other papers made proposals for AMSAT's next major project. Karl Meinzer described a larger, much more capable, Phase III super-satellite





Owen Garriott

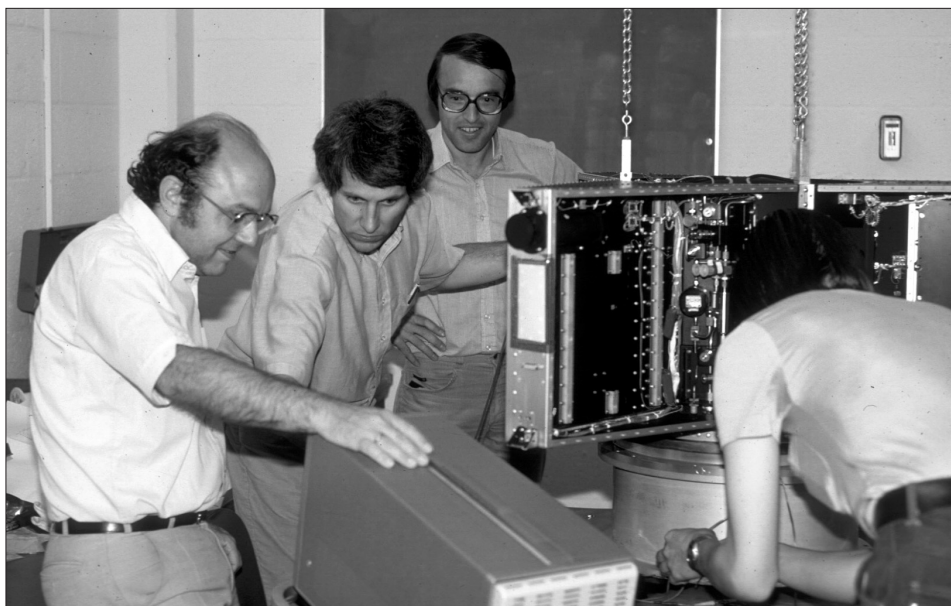
for the high elliptical orbit. Others agreed with larger and better, but urged that the next large satellite should be Phase IV geostationary satellite. It was agreed that Karl and his AMSAT-DL team would pursue the design of the larger high elliptical orbit satellite and AMSAT would conduct a design study for a geostationary satellite. Dick Jansson, WD4FAB (now KD1K), was tasked to lead the AMSAT study.

A New Name??

WAIT!! What's this AMSAT-NA business? At the Vail BoD meeting an issue was brought up addressing the increasing number of national AMSAT organizations around the world that were identifying themselves by AMSAT followed by hyphenated country



Musa Manarov



Phase IIIB at GFSC.

letters. It was proposed that AMSAT should follow this practice itself. While the organization did have a number of overseas members, the vast majority were resident in North America. While not all supported the change, a majority of the board agreed and the name of our organization became AMSAT-North America, or AMSAT-NA. Because of slow acceptance, the issue was raised again at the 1986 BoD meeting following the Fall Meeting at Dallas, Texas and the decision was upheld.

Is AO-10 Becoming Senile?

Beginning in late 1985 AO-10 command stations reported an increasing number of memory errors being processed and corrected in the IHU. Since the error correction software was taking care of things, this was not seen as a major issue, particularly because the errors appeared to be taking place in a limited number of memory locations. Unfortunately, this was only the beginning. By mid-year 1986, major malfunctions were being experienced caused by increasing failures throughout the memory. It became clear that passing through the radiation belts twice on every orbit was having a destructive effect on the memory. The problem had been anticipated and the memory had been shielded, but this had not been sufficient. By the end of the year, AO-10 was essentially brain dead, but still alive. Fortunately, the spacecraft tended to favor a mode that, when it was in sunlight, Mode B was active and could be used. This continued to be the situation for the next several years.

Since the Phase IIIC satellite under

development had been planning to use the same type of memory chips, immediate action was taken to deal with the problem. Fortunately, the project team was able to secure a donation of rad-hard memory chips from the Harris Corporation to replace all those at risk.

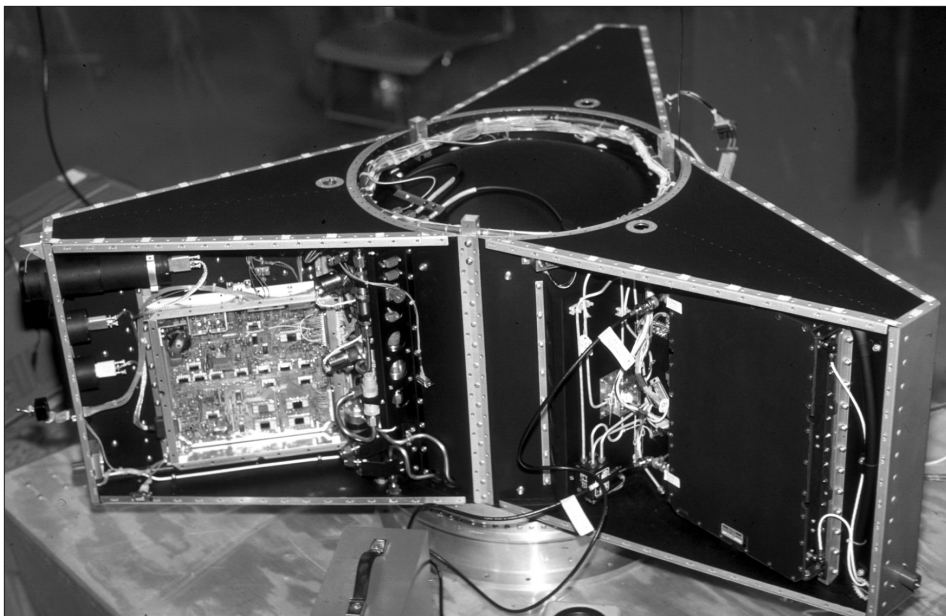
Phase IIIC, Ready to Go

By early 1986 the level of activity at the Phase IIIC Integration Facility in Colorado was ramping up as the structure took final form. The wiring harness was installed and an increasing number of electronic



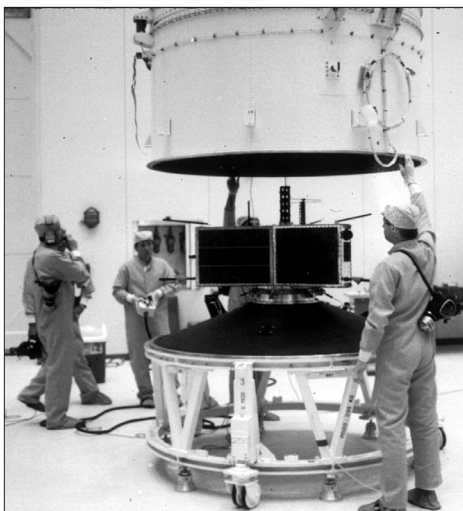
Phase IIIB into the SYLDA.





Phase IIIC.

modules delivered. In late spring, Karl Meinzer and his AMSAT-DL team arrived in Colorado with their modules and an all-up systems checkout was begun. Good progress was made and, at completion, the completed spacecraft was subjected to a rigorous thermal-vacuum (TV) test and came through with flying colors. Following the TV test, the spacecraft was packaged in its shipping container and shipped to Marburg, Germany for balancing, vibration testing and transportation to Kourou, French Guiana for the launch that was scheduled for the following year. During all of this activity, AMSAT members and other interested individuals were kept up to date on the activities through regular and detailed reports issued by "public affairs officer" Joe Flaska, WBORLY, a key member of the integration team.



Phase IIIC.

JAMSAT in Orbit!

In 1984 a joint effort was undertaken by JAMSAT, JARL, NASDA and NEC to develop an Amateur Radio satellite to be launched by a Japanese launcher. It was to be similar in size and configuration to AO-8, carrying two separate Mode J transponders. One would be a linear transponder and the other a digital "store and forward" transponder. The Mode J configuration, 2 m up and 70 cm down, is favored in Japan because of the high amount of local 2 m activity in Japan. AMSAT volunteers gave their support to the project. On August 12, 1986 JAS-1 was successfully placed in orbit. Signals were first heard in South America and soon by others around the world. Telemetry confirmed that all was well and, after checkout in orbit. Fuji-OSCAR 12 was open for business. With the success of this mission, JAMSAT team immediately turned to construction of a follow-on mission, JAS-2, aimed for launch in 1989.

New Tracking Software - With Neat Graphics

While Basic Orbits and its clones had served the Amateur Radio community well for over half the decade, there was a growing interest in graphics. At the 1983 AMSAT Annual Meeting Dick Allen, W5SXD, and Joe Bijou, WB5CCJ, had demonstrated a desktop computer with a built in satellite tracking program that showed a graphical display of the earth as viewed by the satellite. The screen also flashed orbital parameters in real time, including antenna pointing angles. The drawback was that the computer was a custom design that was uniquely

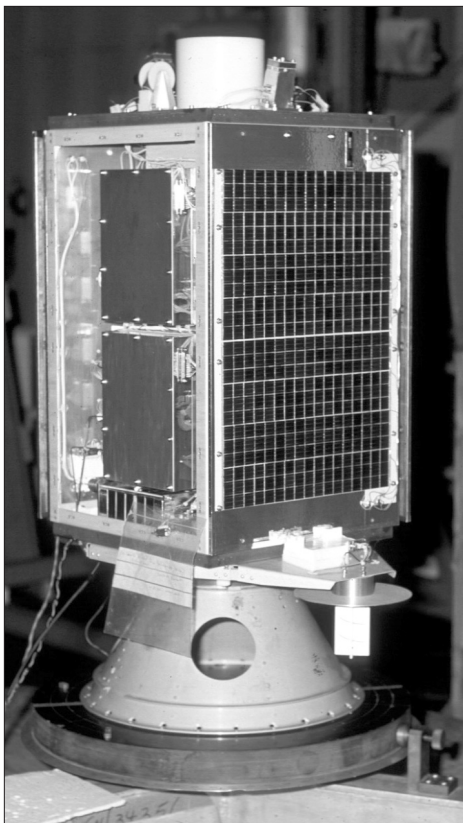
part of the system. Three years later, they formed a small company, Silicon Systems, and brought forth two complementary software programs, GrafTrak II and Silicon Ephemeris. This new software could run on IBM PC's and many of their close clones. They were an instant hit and, sold like hotcakes through AMSAT. These programs were the most popular of their kind for some time until being overtaken by Quicktrak by Bob McGwier, N4HY, and, near the end of the decade, Franklin Antonio, N6NKF's, prize winning, InstantTrack program.

Planning for the Space Station

In an historic meeting in late 1986, organized by Roy Neal, K6DUE, formerly of NBC News, representatives of NASA, AMSAT and ARRL met to consider a program leading to Amateur Radio literally being built into the NASA Space Station under development. Roy had played a pivotal role in the SAREX missions working closely with Owen Garriott, W5LFL, and Dr. Tony England, W0ORE, and was a strong supporter of the Ham-In-Space program. The meeting produced the decision to set up a working group to develop a formal proposal to NASA. AMSAT took the lead for the first steps working closely with ARRL. Tony England's view of the project was that it could play a strong role in developing interests in students of engineering, mathematics and science education. Senior NASA officials who were familiar with both OSCAR and prior SAREX programs were said to view them very favorably and were amenable to building on them further. With the Space Station then scheduled to fly in 1995, it was the first steps toward the beginning of the longest continuing Amateur Radio space program.

Progress Reports on Studies for Phase IV and Phase IIID

In April, 1987, a meeting was held at Boulder, Colorado that brought together the key people involved with planning for the Phase IV geosynchronous satellite. Afterward, Jan King, W3GEY, the study leader, reported that planning was making good progress on all fronts. A team of more than 20 professional engineers and scientists within AMSAT were engaged in intense system and architectural studies. Among the innovative concepts included were attitude control based on a fluid momentum system, thermal control by heat pipes that would allow precise temperature control across the entire surface and extensive application of



UoSAT-1.

digital signal processing (DSP) technology in the electronic systems. At the current rate of progress it was envisioned that a 1991 initial operational capability was possible.

That June, Karl Meinzer released an AMSAT-DL preliminary plan for a new Phase III satellite, Phase IIID. It would be a scaled-up version of Phase IIIC with a very powerful (250 watt PEP) Mode JL transponder aboard. Weighing 400 kg at launch, the satellite could be ready to launch into a Molniya orbit in the 1990-91 timeframe.

A Good Showing at the AIAA Small Satellite Conference

The first AIAA Conference on Small Satellites was held on in October 1987 at Utah State University in Logan, Utah, and AMSAT was well represented. President Vern Riportella was scheduled for the Opening Plenary Session and four technical papers were presented. Dick Jansson addressed Spacecraft Technology Trends in the Amateur Satellite Service, Dick Daniels reported on AMSAT's Bare Bones Propulsion System, Martin Sweeting reported on UoSAT engineering and Gordon Hardman, now, KE3D, described the Integrated Housekeeping Unit. All papers were well received and Dr. Frank Redd, conference general chairman, remarked that AMSAT had an impressive base of

experience in the field of small satellites. Gary Garriott, WA9FMQ, of Volunteers in Technical Assistance (VITA) announced that his organization had received significant funding grants to support their PACSAT project to explore providing communications for remote areas in third world countries.

A VITA PACSAT in the Works

VITA had finally been able to secure grants in sufficient amounts to again pursue development of a PACSAT. Early demonstrations with the DCE experiment on UoSAT-OSCAR 11 had led to the grants. Because of restrictions in the Amateur Radio bands, they chose to use other frequencies especially earmarked for it under a United Nations banner. They approached the University of Surrey to act as prime contractor, with support from AMSAT and TAPR.

How About an AMSAT PACSAT - Why Not Four?

At the BoD meeting at the AMSAT 1987 Fall Meeting in Southfield, Michigan, Jan King gave a report that improvements in technology had made it possible to build a small but very capable Amateur Radio satellite using the packet radio protocol more quickly and cheaply than had been previously been thought. The concept of a "Microsatellite" had been under discussion among many of the AMSAT and TAPR technical teams for some time. The spacecraft architecture evolved in a Detroit hotel room between midnight and 3 a.m. with Dick Jansson's (five stacked trays) mechanical design and the electronics coming from W3GEY, N4HY, KA9Q and W3IWI. Four trays accommodated the mission critical hardware, and the 5th module was called "TSFR" (This Space For Rent) and was used to house each sponsor's unique hardware. The advantages of a short (concept to launch in two years) development schedule, relatively low cost, and the likelihood of a number of launch opportunities, strongly argued to take the project on.

The BoD responded by authorizing an extraordinary crash program to have such a satellite ready within the next two years. A special AMSAT/PACSAT Fund was established to finance the program. The announcement of the PACSAT program based on Microsat technology quickly raised wide interest. In early 1988, Brazil AMSAT, led by Junior DeCastro, PY2BJO, asked to join the program with a Microsat dedicated to broadcasting voice messages

to children around the world. At about the same time Bob Twiggs, leader of the Center for Aerospace Technology (CAST) at Weber State University, expressed interest in joining the program for an earth viewing camera, and a few months later, the newly established Argentina, AMSAT-LU, requested to join the program to develop their own PACSAT.

In short order, the AMSAT Microsat program had expanded to four Microsats, each with differences in payload but sharing a common stacked module structure and basic utilities. Each organization agreed to share the costs of development. With Jan King as Project Manager, teams were formed to develop the common modules and an integration facility was established in office space at a Boulder, Colorado industrial park.

Phase IIIC Takes Flight

The Phase IIIC spacecraft was tested and ready to ride by late 1987. The Ariane launch schedule, reacting to several failures, slipped the Ariane V-23 to June 1988. The launch that took place on June 8, 1988 was picture perfect and our performance during launch and afterwards was the same. Placed initially into a transfer orbit, our improved propulsion system, made two perfect burns and flying our spacecraft into the Molniya orbit we had been trying to achieve for the two previous missions. Phase IIIC was renamed AMSAT-OSCAR-13 and the operations team began a careful check of the onboard systems. Everything went well until efforts to upload flight software to RUDAK failed. The space gremlins had struck again! Repeated efforts were unsuccessful and after extensive analysis it was determined that low temperature sensitivity by one device in the system was culprit. Thus, the only packet radio system on board would not be



UoSAT-1 preparation for launch.



available. With the exception of RUDAK, we had the first AMSAT flagship to be in the proper orbit, in shape, rad-hard and ready to provide years of service.

A Ride for Two UoSATs and Four Microsats

In the fall 1988, and with Surrey taking the lead, negotiations among UoSAT, AMSAT-NA and Arianespace resulted in an agreement to launch seven payloads. The primary payload was SPOT-2, an earth observation satellite. Riding below on a new secondary payload structure, the Ariane Structure for Auxiliary Payloads (ASAP), would carry two UoSATs and four Microsats. The UoSAT-C that had previously been designed to fly on a NASA-Delta mission had to be split into two new UoSAT spacecraft because of weight and balance problems. UoSAT-D would now carry a Packet Communications Experiment (PCE) for VITA, an Amateur Radio digital store and forward communications transponder, and experiments on space radiation effects on spacecraft components. UoSAT-E would carry technology demonstrations and CCD camera experiments. Sharing the ASAP with the two UoSATs would ride the four AMSAT Microsats. With the short launch deadline the Microsat teams went into high gear.

More Hams in Space, and They're Russian

After months of rumors that cosmonauts on the Mir space station would be operating an Amateur Radio station on the 2 m band, it finally happened in November 1988. Team commander Vladimir Titov and Dr. Valeri Poliakov made several contacts with amateurs on the ground. Their fellow crewman Musa Manarov, however, operating as U2MIR made more two-way contacts with amateurs on the ground than all three previous Ham-in-Space missions combined. The first North American contact was made by Byron Lindsey, W4BIW, and Leonid Labutin, UA3CR, operating from Byron's station wagon in the parking lot of the AMSAT-NA annual meeting in Atlanta, Georgia on November 12.

Significant Actions at the 1988 Atlanta Fall Meeting

In addition to the Mir contact, a number of other significant actions took place at the BoD meeting following the Atlanta meeting. Vern Riportella stepped down after five years as AMSAT's President. Doug Loughmiller, KO5I (now W5BL), was elected to succeed him. An AMSAT-TAPR agreement was

reached regarding the development of a DSP unit that could be sold to raise funds. Agreement was reached with AMSAT-Italy, represented by Dr. Alberto Zagni, Vice President Engineering, to cooperate in the construction of a new Italian satellite in the Microsat series and Weber State University was given both authorization and praise for their student efforts in support of the Microsat and Phase IV projects. Lastly, action was taken to restore *The AMSAT Journal* in new format and phase out the ASR. Joe Kasser G3ZCZ/4, recently back in the U.S. again, was appointed editor of the new publication, the same position he had held for many years previously. The first issue of the new *AMSAT Journal* was issued in May 1989 and ASR was discontinued at the end of the year.

The Last Year of the Decade was a Busy One.

Quoting from an editorial on the front page of an early 1989 ASR, "AMSAT-NA is about to celebrate its 20th Anniversary and the Amateur Space Program is on the brink of its most dynamic period: Microsats, UoSATs, Phase IIID, Phase IV-A, Amateur Radio operators in space on board the Mir Soviet Space Station and the US Space Shuttle, and more."

The Microsat Assembly Line

The development of the Microsats brought back memories of the early AMSAT projects, individual modules were again being designed and fabricated in basements and garages. The difference was that they were now being manufactured in batches of four. The flight structures were being machined in groups by the students at Weber State University. Soon the units were streaming to the store front integration facility at Boulder, Colorado where a staff of local amateurs and students set up the assembly line. This was in the classic AMSAT project style: small size, short development period and a good time had by all. A difference was the greater capability and degree of technical sophistication being built into these little boxes. By the fall of 1989, the Microsats were tested and ready to fly but launch schedule slipped into early 1990.

Hams in Space Are There for Good

With increasing opportunities for astronauts and cosmonauts to operate amateur stations in orbit, the value of these activities had been recognized by both NASA and Soviet program managers. Not only were more opportunities coming up for the Space

Shuttle, but good progress was being made toward a permanent Amateur Radio station in the coming NASA Space Station.

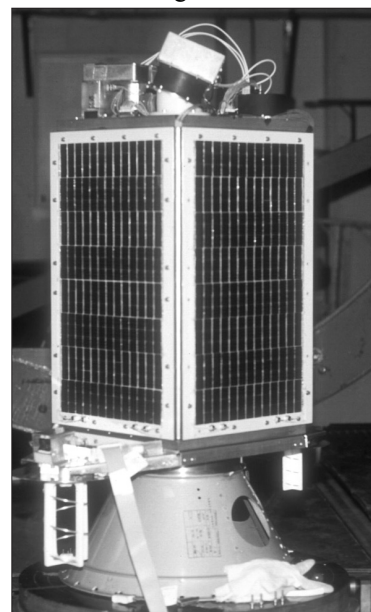
The Next Big Step ?

The AMSAT-NA planning toward a Phase IV geosynchronous satellite was making good progress. The proposed structure was well enough designed for study manager Dick Jansson, WD4FAB, to task the student group at Weber State University to fabricate a full scale model. It appeared that, while the technical challenges were within AMSAT-NA capabilities. Issues of funding and launch opportunities needed to be further addressed.

In Marburg, Germany, Karl Meinzer and his AMSAT-DL team were well along with their design for a larger and more capable Phase III follow-on and they had received assurance of partial funding from the German government.

At Decades End

The decade's final meeting of the AMSAT Board of Directors took place following the Annual Fall meeting at Des Moines, Iowa. Doug Loughmiller was reelected AMSAT President and given the added title of General Manager. The members, BoD and officers could look back with pride at the past ten years. Membership of AMSAT-NA now stood at over 5,700 and continued to grow. A highly capable Phase III satellite was operating in high orbit, hams were operating in space, low orbiting satellites were being launched by other AMSAT organizations and a cluster of Microsats were about to join them. With studies well under way toward more larger and more capable flagships, the future looked bright indeed! ☺



UoSAT-2.



Personal Reflections on Operating OSCAR 10 and OSCAR 13 ... and Beyond

by George Carr, WA5KBH (ex G0WEW), wa5kbh@amsat.org

My interest in the hamsats can be documented to May 5, 1989, when I was accepted as member 21,199 of what was then called AMSAT. An employment transfer put any actual satellite activity on hold. In April 1990, I packed up my XYL and four harmonics in a move from EM30 (southwest Louisiana) to IO91 (Luton, Bedfordshire, 30 miles north of London, England). Some months later, I joined AMSAT-UK and held membership number 4,970. (Actually, my initial interest was launched – no pun intended! – in November 1983 when I successfully received a transmission from W5LFL aboard Columbia.)

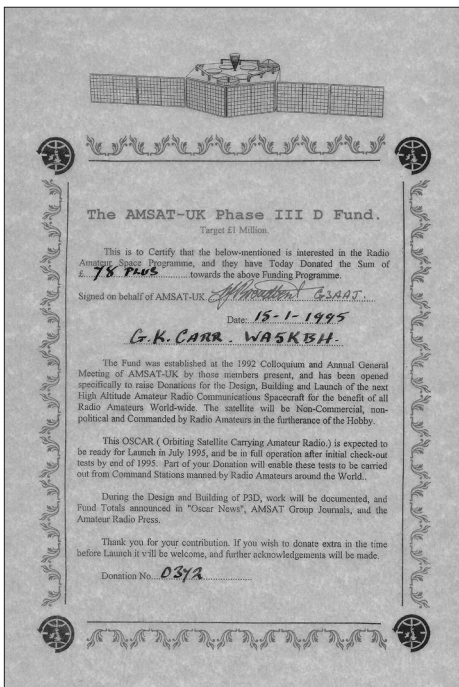


Photo 1: Certificate recognizing donations to AMSAT-UK, dated January 15, 1995. It was received in the post as shown - laminated!

I finally got around to making my first hamsat contact on July 19, 1995, from my new QTH in Luton to The Netherlands (IO91-JO22). From that introductory contact until December 31, 1995, I made 69 hamsat contacts through AO-10 and AO-13. (I think I did a pretty good job of remembering that I did have a family, gainful employment to support my family and hobby, my ministry as a deacon in the Catholic Church, a home to upkeep and a bit of “holiday” time - all to try and balance!) Of these 69 contacts, I worked 52 grids and 30 DX entities in Europe, North America, Africa and Asia. The QSO times averaged from 3-14 minutes. When AO-13

was at a range of 33,300 km, I worked a ZS6 (IO91-KG33) on CW. When the satellite was at 9,800 km, I worked a DG3 (IO91-JN58) on SSB. All other contacts were in the between ranges. Mode B (435 MHz uplink, 145 MHz downlink) was operated. Fifty-one percent of the contacts so noted in the G0/WA5KBH or G0WEW logbooks were for AO-10 while 49% were for AO-13. (OSCAR 10 was 435.030-435.180 MHz uplink and 145.975-145.825 MHz downlink; OSCAR 13 was 435.423-435.573 MHz uplink and 145.975-145.825 MHz downlink.)

Reviewing the contacts and the start of QSOs reminded me that it was not unusual that my operating window times were as much as 96 minutes, 176 minutes, 196 minutes, and even 270 minutes. Talk about long times between Acquisition of Signal (AOS) and Loss of Signal (LOS)! This is due to the Molniya, elongated, egg shape, orbit that took the satellite out 36,000 km (22,000 miles). My experience was that while the signal was weaker at these greater distances, on the earth approach side it only got better with the signal strength increasing as the satellite continued to relay signals back to earth. The beauty was that for a while the satellite appeared to be stationary in the sky, thus movement of the receive and transmit antenna array was nothing compared to today’s “easysats” and the Doppler shift was not as severe.

As for power, I initially tried the Kenwood TS-790A barefoot at 40 watts on the 435 MHz uplink. Then, I decided I needed the extra boost at apogee – the farthest distance away from earth – so I purchased the Mirage D3010, 100 watt 435 MHz amplifier. In my initial package, I bought a Mirage KP2-RC, 20 db gain pre-amplifier for the downlink.

The antennas were the Tonna 9 element 145 MHz (11.0 db gain) and the Tonna 19 element 435 MHz (14.1 db gain) antennas.

Then, as today, I listened for the beacon and adjusted my output power such that my signal was not greater on the downlink than was the beacon. And, like today, once I found a clear receive frequency, I tracked my transmit frequency to stay on that receive frequency, thus doing my best to avoid any QRM to other users of the bird.

I would also point out that today we are spoiled. In the mid-90s Keplerian elements

were input into your computer program by hand. (WISP) No automatic updates! To be fair, generally, you only needed to update these figures monthly.

While in the United Kingdom, I attended two AMSAT-UK Colloquiums. I maintained both my AMSAT-NA and AMSAT-UK memberships during the six years in England.

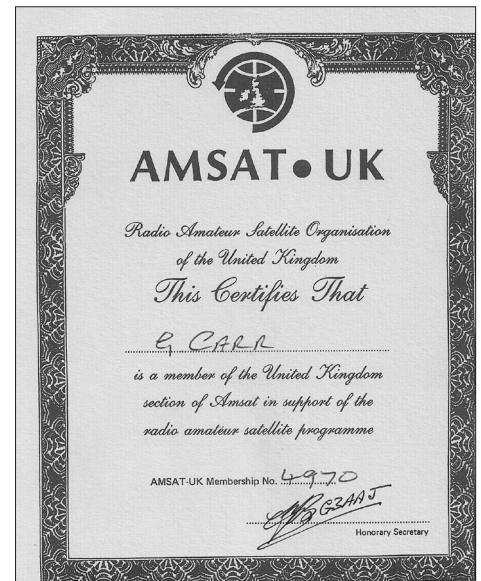


Photo 2: AMSAT-UK membership card.

I returned to the USA and EM30ih (southwest Louisiana) in April 1996. It took till March 2, 2007, for me to rediscover the hamsats. At the Greater Houston Hamfest, N5AFV conducted a program on how easy it is to operate the easysats. Those first contacts at WA5KBH were on AO-51 with an Arrow antenna, an Icom W32A, and a very cooperative and patient XYL logger, especially on sticky nights when in southwest Louisiana every bug imaginable descends upon warm bodies. Hi!

Using a variety of ham gear since then, I have enjoyed many QSOs on AO-7, AO-16, AO-27, FO-29, SO-50, AO-51, VO-52, the ISS repeater and voice contact with NA1SS (W5KWQ operating) last October 2008.

I look forward to the hamsats being developed and awaiting launch dates.

Before I close, I have one last note for the DX chasers in the USA who might be reading this. A whopping 95.6% of my British QTH hamsat contacts were DX contacts (outside of my station country - England!). Jealous? What more justification do we need to have



access to birds like Eagle and P3E?

While it was fun to operate satellites like AO-10 and AO-13, we need to support projects like Eagle and P3E, so that many of you (and we) might have similar experiences. Operating these kinds of satellites is very different and exciting. May I encourage you to support AMSAT-NA and other AMSAT organizations beyond the yearly dues? For us to continue developing and using the hamsats, we as current users – and possibly you as future users - need our joint voluntary support beyond the minimum. 📡

 SATELLITE FREQUENCY GUIDE AMSAT-UK (1995) [All frequencies in Mhz]	
OSCAR 10 (Phase 3B) Mode B General Beacon 145.809 (Carrier) Engineering Beacon 145.987 Uplink 435.030 - 435.180 Downlink 145.975 - 145.825	OSCAR 18 (Webersat) Downlink (RC) 437.102 (BPSK/SSB) Downlink 437.075 (BPSK/SSB) Uplink 145.900 Uplink ATV 1265.000 (TV/AM) (NTSC)
OSCAR 11 (UoSAT 2) Beacon 145.826 (AFSK/FM) Beacon 435.025 (AFSK/FM) Beacon 2401.500 (AFSK/FM)	OSCAR 19 (LUSAT) Uplinks (AFSK/FM) 145.840, 145.860 145.880, 145.900 Downlink (PSK) 437.150 (BPSK/SSB) CW Beacon 437.125 (CW)
OSCAR 13 (Phase 3C) Mode B General Beacon 145.812 (PSK,CW,RTTY) Engineering Beacon 145.985 (PSK,CW,RTTY) Uplink 432 - 435.573 (SSB/CW) Downlink 1 145.975 - 145.825 (SSB/CW)	OSCAR 20 (Fuji) Beacon 437.795 (CW) Mode JA Uplinks 145.900 - 146.000 (SSB/CW) Mode JD Uplinks 145.850, 145.870 (AFSK/FM) 145.890, 145.910 (AFSK/FM) Mode JD Downlink 435.910 (BPSK/SSB)
Mode S Beacon 435.175 (9600bps FSK/FM) Beacon 2400.325 (PSK/RTTY) Uplink 2400.664 (PSK/RTTY) Downlink 435.603 - 35.639 (SSB/CW/FM) 2400.711 - 2400.747 (SSB/CW/FM)	OSCAR 22 (UoSAT 5) Downlink 435.120 (9600bps FSK/FM) Uplink 145.900 (FSK/FM) Uplink 145.975 (FSK/FM)
OSCAR 16 (Pacsat) Uplinks (AFSK/FM) 145.900 145.920 145.940 145.960 Downlink (PSK) 437.025 (BPSK/SSB) Downlink (RC) 437.050 (BPSK/SSB) Downlink (S) 2401.2205 (BPSK/SSB)	OSCAR 23 (KITSAT A) Downlink 435.175 (9600bps FSK/FM) Uplink 145.850 (FSK/FM) Uplink 145.900 (FSK/FM)
OSCAR 17 (Dove) Beacon 1 145.82516 (AFSK/FM,Dig.voice) Beacon 2 145.82438 (AFSK/FM,Dig.voice) Beacon S 2401.2205 (BPSK/SSB)	OSCAR 25 (KITSAT B) Downlink 436.502 (9600bps FSK/FM) Uplink 145.870 (FSK/FM)
Published by AMSAT-UK, LONDON E12 5EQ Tel: 0181 989 6741. Fax 0181 989 3439	OSCAR 26 (ITAMSAT) Downlinks 435.867, 435.822 Uplinks 145.875, 145.900 145.925, 145.950

Photo 3: AMSAT-UK satellite frequency guide, dated 1995.

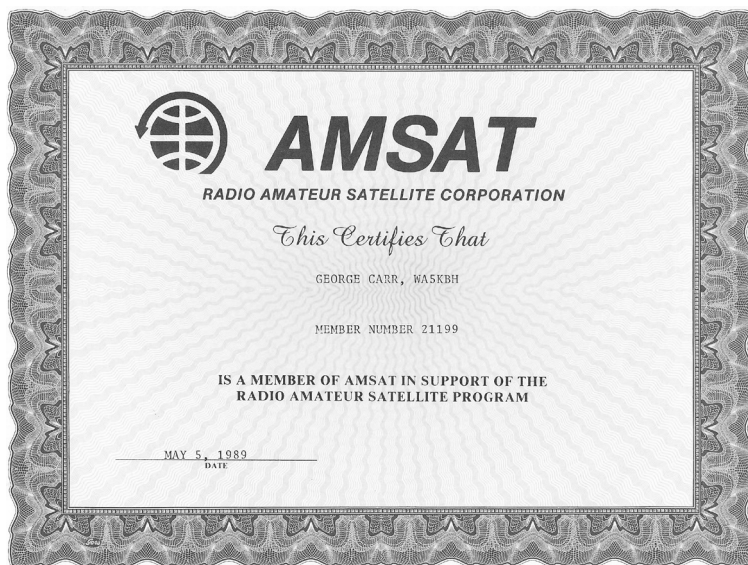


Photo 4: AMSAT membership certificate, dated May 5, 1989.


RADIOCOMMUNICATIONS AGENCY

Validation Document

United Kingdom of Great Britain and Northern Ireland, the Channel Islands and the Isle of Man.

Wireless Telegraphy Act 1949

Amateur Radio Licence (A) (Temporary)

(a) Licensee's Name MR. G.K. CARR (b) Call Sign G0WABKBT

(c) Mailing Address 44 FAIRFORD AVENUE
LUTON
BEDS
LU2 7ER.

(d) Main Station Address 44 FAIRFORD AVENUE
LUTON
BEDS
LU2 7ER.

(e) Valid until 17.4.92.

This licence (the "Licence") granted on 18.4.91 ("Date of Issue") by the Secretary of State for Trade and Industry to the Licensee named in paragraph (a) above under section 1 of the Wireless Telegraphy Act 1949 authorises the Licensee to establish, instal and use sending and receiving apparatus for wireless telegraphy at the Sta [as defined in sub-clause 1(10)] in accordance with the Terms and Limitations Booklet BR which is incorporated into and forms a part of this Licence.

Issued on behalf of the Secretary of State for Trade and Industry.

The Validation Document is issued upon receipt of the current licence fee.
SP 1958

The Radiocommunications Agency is an Executive Agency of the Department of Trade and Industry.

Photo 5: Photocopy of a validation document dated, April 18, 1991. Note that it is hand written and issued for one year. At that time, all RA (Radiocommunications Agency - equivalent of our FCC, but for radio communications) Amateur Radio licenses were issued for one year. A ham had to re-apply each year. Toward the end of my stay there, I applied for and was issued G0WEW, which I chose and awaited its alphabetical issue - because it sounded so good on CW! NOTE: Effective December 29, 2003, the U.K. Office of Communications (Ofcom) began issuing licenses for amateur operators in that country.





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- Open architecture
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- Supported by the major tracking programs
- Uses GS-232A or Easycomm I/II protocols

Contact Martha at the AMSAT office 301-589-6062 to order.

The complete units will be built in groups, so get your orders in early.

Units will be shipped as they become available.

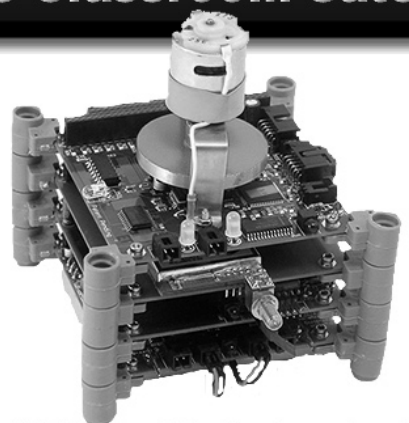
- 1) Bare board - \$20 + S&H - no parts kits available
- 2) Populated board, serial interface - \$100 + S&H - no kit with USB unit, rotor cable and LCD available, we do have a parts list with recommended part numbers and sources.
- 3) Custom Ten-Tec Enclosure powder coat, silk-screened, drilled/punched - \$50 + S&H
- 4) Complete unit - board, USB output, rotor cable, LCD, enclosure - \$200 + S&H **our most popular

Documentation for the LVB Tracker can be found at: <http://www.LVBTracker.com>

Boards and complete units may be ordered from the AMSAT office at 301-589-6062 or from martha@amsat.org



The Classroom Satellite



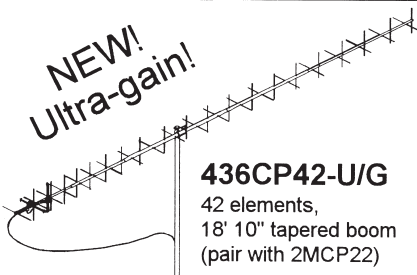
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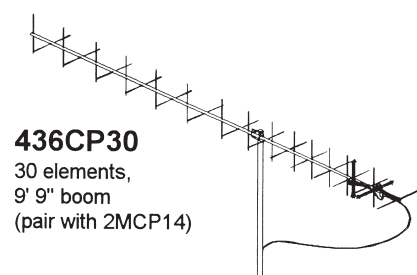
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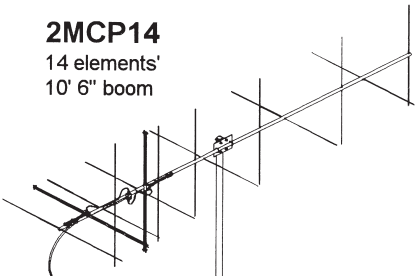
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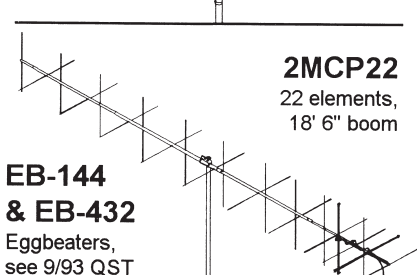
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(pair with 2MCP22)



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9' 9" boom
(pair with 2MCP14)

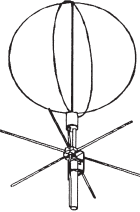


2MCP14
14 elements'
10' 6" boom



2MCP22
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the ISS safety review to gain approval for the hardware to be released from the ISS. To date, we've spent about \$13,000.00 on this project and we expect total outlays to be less than \$30,000.00. In satellite construction and launch costs, this is a relative pittance, particularly for a satellite of the size of ARISat-1. The ARISat-1 is expected to weigh around 27 kg (59.5 lbs) including the battery (6.3 kg), so the cost per kilogram to build and place ARISat-1 in orbit is unbelievably low compared to the current pricing to launch a CubeSat that is around \$70,000 per kilogram. ARIS is being given this opportunity because of the educational outreach potential of ARISat-1 that meets the expectations of Energia and NASA. Both organizations see value in what ARIS and AMSAT are delivering to the ISS. Educational outreach provides the opportunity to deliver a package that will also benefit Amateur Radio operators. These opportunities to provide a dual-benefit (education outreach and Amateur Radio) will likely drive future opportunities to placing platforms in orbit as well.

Lastly, please keep in mind that ARISat-1 is currently AMSAT's primary engineering project that offers not only an outstanding flight opportunity but is an essential step in the development of AMSAT's engineering team. The ARISat-1 satellite builders consist of several individuals who have not been involved with prior satellite projects. They are gaining valuable experience that will be incorporated into other AMSAT projects in the future. We're fortunate that we're developing the next generation of satellite builders through ARISat-1 and other upcoming projects.

AMSAT Clean Room/Educational Outreach

The legal process continues with regard to reclaiming our clean room from the Hawk Institute for Space Sciences (HISS) and University of Maryland Eastern Shore (UMES), obtaining relief for the expenses that AMSAT incurred in the relocation of the clean room and equipment to Pocomoke City, MD and for monies spent to fulfill local building codes to obtain a certificate of occupancy. At this point there isn't much to report on the legal front.

On a brighter note, significant progress has been made to find a new home for the AMSAT Lab as well as establish a formal relationship with a major university. If all goes well, I expect that AMSAT will be in

continued on page 25 ...

Help Wanted

AMSAT needs qualified volunteers for a number of positions!

If you want to be a part of the solution in making AMSAT operational and work toward designing, building and finding a launch, WE NEED YOU!

No pay for 5+ hours per week, but a great deal of satisfaction in knowing you are helping make something happen.

We need people with these skills:

- Marketing
- Sales
- Software engineering
- Hardware engineering
- PC based software design
- Web design and maintenance
- Project management
- Documentation
- Hardware testing
- Software testing
- Hardware prototyping
- Specific area Web site information maintenance
- Video recording, digital conversion and editing
- Write technical or instructional material
- Educational activities
- Promoting AMSAT as an Area Coordinator



and any other area you think you think you can make a difference.

We often have people volunteer, but many don't deliver on their promises. So, pick an area that you think needs improvement and explain what you will do to make it better. Then do something to show that you can follow through.

Send your suggestions, actions plans and a description of why you are capable of doing this task to Gould Smith, WA4SXM, wa4sxm@amsat.org

The AMSAT Store (see www.amsat.org) is back online! Here is a new AMSAT product.

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- ✓ Everything at the Platinum Donor Level, PLUS:
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☐ \$2400 one time

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Every **Gold Donor** receives gifts of:

- ✓ Everything at the Silver Donor Level, PLUS:
- ✓ A personal invitation to the AMSAT Dayton dinner (free).

☐ \$100 / month

☐ \$1200 one time

Silver Donors contribute at least US \$50 per month.

Every **Silver Donor** receives gifts of:

- ✓ Everything at the Bronze Donor Level, PLUS:
- ✓ A personal invitation to a reception with the AMSAT Directors, Officers and project designers and builders (free).
- ✓ Annual endorsement sticker after each year of donation.

☐ \$50 / month

☐ \$600 one time

Bronze Donors contribute at least US \$25 per month.

Every **Bronze Donor** receives gifts of:

- ✓ A unique "AMSAT President's Club" certificate.
- ✓ A specially designed AMSAT President's Club Donor pin.

☐ \$25 / month

☐ \$300 one time

Core Donors contribute at least US \$10 per month.

Every **Core Donor** receives gifts of:

- ✓ A specially designed AMSAT President's Club Donor pin.

☐ \$10 / month

☐ \$120 one time

Choose where your contribution should go:

☐ AO-Echo ☐ AO-Eagle ☐ ARISS ☐ Future Projects ☐ General Fund

☐ RENEW my
President's Club
AUTOMATICALLY
every year!

☐ I prefer to make my donation in one yearly payment of \$ ____.

(Credit card only, please.)

THANK YOU!



ARISS on the Road

ARISS was present at the Quebec City hamfest in nearby St-Romuald. On August 1, Maurice-André Vigneault, VE3VIG/VA2MA, AMSAT Canadian Delegate to the ARISS International Working Group (WG), set up a display and satellite communications demonstration station at the well-attended flea market. RAC Delegate to the ARISS-IWG, Daniel Lamoureux, VE2KA, came from Montreal to participate in the hamfest.

As you can see in the picture, on the left is the ARISS display underlining the participation of AMSAT, NASA, CSA, RAC and RAQI, which is the French component of the Canadian Amateur Radio community. Most of the signs are in French and a folding pamphlet was freely handed out explaining ARISS and AMSAT. The CSA also provided handouts, stickers and decals that were quickly snapped up. We are awaiting the AMSAT banner for our next outing.

On the right of the picture, is a display to demonstrate that you need not spend a fortune to work satellites. A camera tripod, an Arrow II antenna, a dual-band radio to counterbalance the antenna and an ACER mini notebook showing the Orbitron (freeware) program for satellite tracking completed the station. This setup drew a lot of interest and we pointed out the more sophisticated tracking program such as SatPC32 and Nova, both available through AMSAT.

We even had a much simpler setup to work the ISS and other FM satellites. A dual-band handheld, an extendible whip with gain, in this case the ANLI AL-800 and a PDA harbouring the "PocketSat" software provided a good demonstration of how to get into satellites at the very basic level.

Interested visitors kept us busy and we did not see the time fly by. Our next stop is the Ottawa Hamfest in nearby Carp, Ontario, on September 12. We hope to have an enhanced display and more handouts that include the translation of the ARISS/AMSAT pamphlet. We will follow the fleamarket circuit as long as we are supplied with promotional material to let the word out on the ARISS program.

Maurice-André Vigneault, VE3VIG
AMSAT Canadian Delegate
ARISS International Working Group



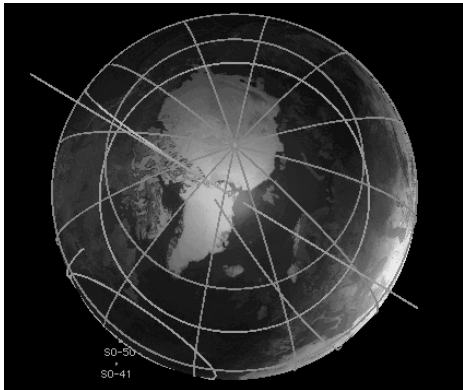


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2009 AMSAT Space Symposium and Annual Meeting October 9, 10, 11, 2009 – Baltimore, MD, Airport

Hotel:

Four Points by Sheraton BWI Airport Hotel; 7032 Elm Road, Baltimore, MD 21240. Phone: 1-410-859-3300. The special Symposium rate for Wednesday, Thursday and Sunday is \$115 each night, Friday and Saturday are \$90 each night. Use **"Radio Amateur Satellite Group" for booking**. The hotel has a free shuttle to the BWI terminal. <http://www.starwoodhotels.com/fourpoints/property/overview/index.html?propertyID=856>

Airport Information:

The Baltimore-Washington International Airport (BWI) is serviced by most US and International airlines. Southwest Airlines has non-stop service to more than 37 cities and one-stop or connecting flights to many others. AirTran also provides major service at BWI. More information can be obtained from <http://www.bwiairport.com/en>

Getting There by car:

The hotel is on the entry loop to BWI airport. The GPS coordinates are 39 deg 11' 03.09" N, 76 deg 40' 23.63" W.

REGISTRATION: (register online <http://www.amsat.org/amsat-new/symposium/2009/index.php>)

	Each	Quantity	Total US\$
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After Sept 15, 2009	\$45.00		
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PROCEEDINGS OF THE AMSAT-NA

2008 Space Symposium and AMSAT-NA Annual Meeting

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by Timothy J. Salo, AD0DO
- Medium Earth Orbit - An affordable alternative to HEO?
by David Bowman, G0MRF
- AO-51 Operation Before, During and After the No Eclipse Period
by Gould Smith, WA4SXM
- Suitsat-2/Radioskaf-2: The Second Amateur Radio Space Suit Project
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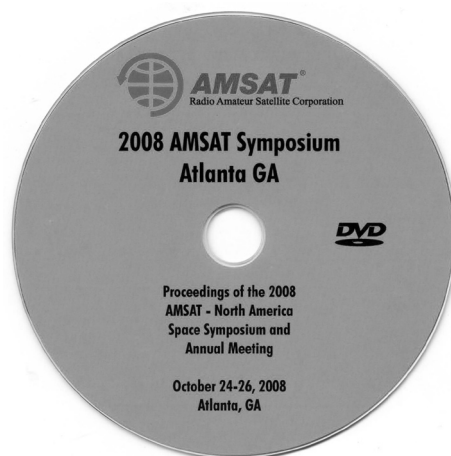
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2008 Proceedings DVD's also available. Contact the AMSAT Office.

A new DVD for the 2008 Symposium is available. It has the presentations, audio files and papers.
Dan Schultz's Banquet Talk on The Hubble Space Telescope Repair Mission - slides and audio
Phil Hartman's Introduction to DSP Workshop - slides and audio plus
2004 Symposium papers
2005 Symposium papers
2007 Symposium papers





position to make a major announcement at the AMSAT Symposium regarding a future relationship. In addition, there are several other 'outreach' activities under discussion that could provide significant educational opportunities for university-level students that could also assist AMSAT in some of our engineering development programs. I hope that we'll be able to make a formal announcement on this in the near future as well.

Why 'tantalize' everyone with these vague statements? There are two reasons: 1) Establishing educational outreach opportunities is a critical concern for AMSAT not only in terms of fulfilling our mission/vision but providing another avenue incorporating engineering talent into our programs; and 2) make it clear that we are not allowing our current legal battle concerning the Clean Room to impede the work being done to establish a successful relationship that will provide benefits to both an educational partner and AMSAT. Clearly, there are no guarantees at this point in time that our current discussions will bear fruit, but AMSAT's senior leadership is working hard to bring this to a successful conclusion.

ITAR

AMSAT continues to address the impact of ITAR (International Traffic in Arms Regulations) on our ability to work with our international partners on joint Amateur Radio satellite projects. Previous Apogee View columns provide background on the progress we've made regarding our voluntary disclosure and the response from the US State Department's Directorate of Defense Trade Controls (DDTC). Submitting the voluntary disclosure was done for two reasons: a) gain closure on past actions and allow the burden of uncertainty regarding legal concerns of our volunteers involved with P3-E to be removed; and b) lay the foundation for AMSAT to seek Commodity Jurisdiction Requests to have our P3-E activities be reassigned to the Commerce Department's Export Administration Regulations (EAR). EAR, for example, allows technical discussions to take place with foreign nationals that wouldn't be allowed under ITAR unless a Technical Assistance Agreement (TAA) were to be signed by both AMSAT and the foreign AMSAT organization and approved by DDTC.

On July 23, 2009 AMSAT submitted four

Commodity Jurisdiction Requests to cover the four areas of AMSAT's involvement with P3-E development: SDX, IHU-3, Can-Do! Bus, and thermal design. It will be several months before AMSAT receives a decision on our submissions, as the applications are reviewed by various federal agencies, such as the Commerce Department, Department of Defense, and State Department.

A successful outcome on our request will provide a significant milestone in re-establishing technical relationships with AMSAT-UK and AMSAT-DL while maintaining full compliance with the US law. It will also allow AMSAT to resume technical support of P3-E as AMSAT-DL may request.

Communicating with the AMSAT Leadership

AMSAT is an all-volunteer organization (with one paid employee) with those in position to volunteer spending many hours working on behalf of AMSAT. Most of our volunteers also have 'real jobs' plus family responsibilities. The time that our volunteers spend contributing to the overall success of AMSAT can be limiting and must be focused on getting meaningful work accomplished in the limited time available.

The AMSAT leadership is open and anxious to respond to membership input and feedback and address questions that our members may have about the organization, the strategic direction we're taking, and what our future expectations are. Attending Symposium offers one avenue for members to contact the AMSAT leadership since the entire leadership team (BoD members and senior officers) as well as others who play significant roles in the organization will be at there. The Dayton Hamvention is another opportunity to interact with the majority of the senior leadership team and members of the Board of Directors.

The most common mechanism for members to contact the AMSAT leadership is via e-mail. The AMSAT Web site offers a pipeline where anyone may send an e-mail to the AMSAT officers and board members. Further, the e-mail addresses of the members of the AMSAT Board of Directors and the Senior Leadership Team are listed on the masthead of *The AMSAT Journal*.

Those of you who utilize the amsat-bb as a means of exchanging ideas, technical discussions, etc. know that this is an effective tool for sharing information. However, it is a

very ineffective tool for gaining information from a specific group of people (e.g. the senior leadership team or BoD) for several reasons:

- Not everyone reads amsat-bb
- Individuals usually don't respond to e-mails not specifically addressed to them
- Given the nature of exchanges on amsat-bb, there isn't much encouragement for people to respond
- Our volunteers who serve in leadership positions devote a significant amount of time to AMSAT. Given lack of time, they will likely focus on issues and concerns that are brought directly to their attention.

The best way to get a response from someone in a leadership position is to follow some guidelines:

- Do not assume that an e-mail sent to 'the world' will get a response. Our volunteers are pretty busy people. If they see an e-mail sent to a group, they will assume that 'somebody' will answer and of course 'nobody' does.
- Address your query to a specific individual using the Web-based system available on our Web site. Alternatively, use the person's AMSAT e-mail alias.
- Select an individual who you think is in the best position to address your query and send a note to one individual. If that person is not in position to address your query, it will be forwarded to someone who can answer you. Take the time to look at the masthead of *The AMSAT Journal* or the officer's page on the AMSAT Web site to see who covers which areas of responsibility.
- Be respectful of others. Again, our volunteers are working hard and don't deserve to get hate mail. If you have a specific question, ask it. Make it simple for the other guy to respond by focusing on only one issue.
- As the majority of our volunteers have day jobs and may have piles of e-mails to go through, be patient about a response. If you haven't seen a reply in a week, resend your original query. Understand that our volunteers only have so much time per day or week to devote to AMSAT.

continued on page 31 ...



AMSAT Board of Directors Meeting Report

October 23 & 24, 2008

Atlanta, GA

The meeting was called to order by AMSAT President Rick Hambly, W2GPS, at 8:07 a.m. EDT on Thursday, October 23, 2008.

Members of the board of directors present during the meeting were:

Barry Baines, WD4ASW, President
Tom Clark, K3IO, President Emeritus
Drew Glasbrenner, KO4MA, Vice President Operations
Rick Hambly, W2GPS, Immediate Past President
Lou McFadin, W5DID
Gunther Meisse, W8GSM, Treasurer
Bill Ress, N6GHZ Alternate
Gould Smith, WA4SXM, Vice President User Services

Other officers present were:

Lee McLamb, KU4OS, Corporate Secretary & Vice President Special Projects
Martha Saragovitz, Manager

Other AMSAT members participating and/or observing included:

Jim Heck, G3WGM
Dee Interdonato, NB2F
Dave Jordon, AA4KN
Pat Kilroy, N8PK
John Klinghoffer, WB4LMN
Tim Lilley, N3TL
Nick Pugh, K5QXJ
Doug Quagliana, KA2UPW
Robert Reynolds,
Graham Shirville, G3VZV
Bill Tynan, W3XO

Martha Saragovitz presented Rick Hambly with a token of appreciation from the board for his years of service as AMSAT President.

Election of Officers, Rick Hambly presiding:

Barry Baines, WD4ASW, was elected president by a vote of 6 votes aye, 1 nay. Barry Baines then assumed the role of presiding officer. The following other officers were elected by a unanimous vote:

Vice President, Operations, Drew Glasbrenner, KO4MA

Vice President, User Services, Gould Smith, WA4SXM

Secretary, Lee McLamb, KU4OS

Treasurer, Gunther Meisse, W8GSM

Manager, Martha Saragovitz

The following officer positions are currently open:

Executive Vice President
Vice President Engineering
Vice President Marketing

Executive Team Reports

President's Report for 2008 provided by Rick Hambly

Rick observed that most of what he achieves is done quietly behind the scenes. In looking backward, Rick felt the first year of his presidency was the best. However, the following 3 years have been a struggle to fulfill the promises and goals set that first year. What is needed is real involvement by the board and others. At this time we are not one single transistor on a single board closer to meeting those goals. Rick expressed deep concern about the future of AMSAT if everyone doesn't get involved. He noted that too many are willing to say 'you can't do it' but don't offer solutions or participate directly.

Martha commented that while the board members have individual interests, they must also work to support whatever mission and vision is accepted as the goal of the organization.

Barry noted that the board sets policy, while it is the officers who implement those policies. This distinction in roles is sometimes not obvious due to the fact that many board members also serve as officers.

Secretary's Report for 2008, provided by Barry Baines

Minutes of the previous board meeting have been published in the *The AMSAT Journal*. Tom Clark moved to accept the minutes as published. The motion carried unanimously.

Treasurer's and Information Management Report for 2008, provided by Gunther Meisse

Gunther observed that we are on-budget for 2008 year to date and he distributed the current balance sheet. Noting that we are financially on-track, he opined it's mostly because we didn't build anything that had been planned.

A breakdown of the investment allocation was distributed to the board. It showed that the investment values were down 28%,

while most markets are down 25-33%. Our goal, as provided to the financial advisors, was to seek 'moderate growth'. Gunther did not recommend changing the allocation of assets at this time because it locks-in losses. When asked whether we should provide specific investment direction to the advisors, Gunther stated that they wouldn't accept that approach. He explained that their company constantly assesses the performance of the various sector managers and they have no loyalty to any one manager. Barry asked what happens to donated stock? Gunther replied that typically it's not sold and the funds reinvested, unless we are specifically directed to do so. Gunther noted that the advisors are currently 'beating the market'. Gould Smith made a motion to reappoint the current advisors. The motion carried by a unanimous vote.

An initial draft budget was presented. It's just an operating budget and does not include any engineering expenses. These will be determined by the Mission and Vision Statements. A discussion followed. The draft budget is balanced, but it carries no engineering expenses. Any construction projects will require additional funding. Barry asked how much money should we carry as a reserve? Martha advised that our auditors have suggested 12 month's worth, while Gunther noted that many large companies carry 18 months.

Gunther moved to accept the preliminary 2007 audit. The motion carried unanimously. Tom moved to reappoint the current auditors. Rick reported that he had investigated two alternative accounting firms, one to assist with bookkeeping and another to handle the audit. The estimated total cost of hiring both companies was only 50% of what the current firm charges. Gunther recommended against making a change because the present accountants work well with Martha. The motion to retain them carried with 6 aye and 1 nay votes.

The national fund raising campaign is on hold until our projects are defined and the current economic environment improves.

The suspected security breach at the provider of the Internet server used by the online AMSAT Store has been resolved and the Store is once again in operation.

The AMSAT Information Management



System (AIMS) is essentially complete. It needs to be updated with current information and brought online. The AMSAT server is being relocated from Rick's house to the server farm located at Gunther's company. A preferable location would be the AMSAT business office; however there are issues there concerning connectivity and lack of support staff.

Gunther noted that while Rick is doing a good job filling in as Webmaster, we continue to be in need of a volunteer to fill that position. Drew Glasbrenner noted that Rick has also done a good job maintaining Web pages for Operations, orbital predictions and other activities.

Lou McFadin supported the hiring of a Webmaster. Gunther replied that is an option, but we are still looking for a volunteer. Jim Heck, Hon. Secretary of AMSAT-UK, asked about the plan to establish a members-only section on the AMSAT Web site? The reply was that it's dependent on getting AIMS online and addressing the question of how members of other AMSAT will be granted access. Procedures and policies for sharing information need to be worked out in a manner acceptable to the privacy concerns of each AMSAT organization involved. Barry noted that the question remains of what content will be included.

Another IT project is an SQL-based AMSAT volunteer talent database. The goal is to develop a system wherein volunteers can update their own data. This information would be used when AMSAT leaders are looking for help. To keep the information current, annual questionnaires for updating will be sent by e-mail to those included in the database.

Access to the amsat.org server has been reviewed. Some of the individuals granted access have not used it for more than 20 years. Their number needs to be greatly reduced. The list of who is responsible for what also needs to be brought up-to-date.

Human Space Flight and ARISS Report, provided by Frank Bauer, KA3HDO, via Telecon

Richard Garriott's flight has had a huge impact. Many messages regarding the flight appeared on AMSAT-BB, almost all of which were positive. Nearly 2000 images were uploaded to the server. As a result of the heavy message load, a quick move had to be made from the AMSAT server to one at Berkley. The ARISS team was faced with

a minor challenge late in the launch timeline as no AA batteries for the VC-H1 were available from the US group. Through some great ARISS negotiations with the Russian team, ARISS was able to get the AA batteries from them for the SSTV rig. Another benefit received from Richard's flight was the gain of many new volunteers having Internet savvy. The next space tourist, Simone Garneau already holds an amateur license. Frank reported that he experienced some difficulties during negotiations concerning the Space Act agreement resulting from unauthorized press releases. That issue was addressed directly with the individuals involved.

SuitSat-2 has made impressive progress during past six months. Frank thinks what we're presently doing now is at about the right pace. Hardware and software requirements must be met no later than January/February 2009.

ISS crews may increase to 6 persons. Mike Finke, KE5AIT, will be on board the ISS for six months. He is expected to be quite active and may possibly help troubleshoot some existing ARISS equipment problems. The first 3-way school contact with ARISS occurred recently.

It is expected that travel expenditures for the coming year will include a trip by team members to the Canadian Space Agency and later in the year to the ESA ESTEC.

NASA's chief of the ISS Program Office has been looking at the ARISS project. Most of the dialog resulting has concerned a potential change in status from "crew equipment" to "payload". The ARISS team is currently working to understand the implications of this change.

Lou McFadin added that the launch carrying the V/U antennas for the Columbus module is planned to be on STS-128 in August 2009. Based on this date, the antennas will need to be delivered to NASA by November, 2008.

Manager's Report for 2008, provided by Martha Saragovitz

Downtime of the AMSAT Store caused a decline of approximately 25% in the number of new membership applications received because most applications are now submitted through the Store. Renewals declined 10%. For members who do not respond to the first renewal notice, a reminder is sent as a follow up. While book sales are steady, there are fewer purchases of software. There is a need for new software

products.

It's time to perform Life Member verifications again. It was suggested that membership application forms be sent along with the request for updates. These would be for distribution to interested acquaintances.

The business office staff, in addition to Martha, consists of two volunteers in their late 70s. Barry asked about recruiting other volunteers who could work at the office. Martha commented that the present crew is very reliable.

The conversion of our financial data from AccPAC accounting software to QuickBooks format went well and monthly financials are now distributed as a single PDF file.

Due to a lack of volunteers, some major hamfests have lacked AMSAT representation. One such hamfest was in the important Washington D.C. area. Gould Smith noted that the New York City hamfest has had similar issues.

A volunteer is needed to design in-house ads for the items that AMSAT distributes.

Shipping costs for *The AMSAT Journal* sent to addresses overseas are significantly higher than for members in North America. The cost for sending a single copy to a foreign address is approximately \$2.00 each.

The lease for the AMSAT office space is up for renewal. The proposed lease would extend through June 30, 2011. There is a provision for a 3% increase; however that didn't occur this year. Gunther made a motion to approve renewal of the lease. It was carried by a unanimous vote.

External Relations Team Report, provided by Lee McLamb

1) Education

We had several false starts toward establishing an AMSAT Institute during the previous year. In Lee's opinion this was due primarily to constantly changing requirements, schedules and the lack of any realistic funding. As the situation evolved during the year with our lab in Pocomoke City, MD, it seemed unlikely that we would have been able to host any activities.

At the request of the previous president and a perception of negative attitudes expressed by others that hampered effectiveness of the Director of Education, he was asked to step down. This position is currently open.

A new and interesting opportunity for collaboration is evolving in Florida. During



the past several years several AMSAT members there have been volunteering their efforts to implement Florida Space Grant initiatives. One of these involves relocating a partially built amateur satellite ground station to the Center for Space Education at the Kennedy Space Center's Visitor Complex. This organization hosts an annual Florida University Satellite Design (FUNSAT) competition that some AMSAT members have already been participating with as mentors and evaluators. They also have a high-altitude balloon program and conduct student and faculty workshops. Because they are already doing many of the things which AMSAT would like to have as part of our activities, this appears to have a good potential to finally get our educational program off the ground. Barry will be travelling in the central Florida area in November and will try to set up a meeting to further develop this relationship.

2) Government & Regulatory

AMSAT still has a pending Petition for Reconsideration filed with the FCC regarding orbital debris. No action has been taken by the FCC. Given the increasing attention this subject is receiving, it appears unlikely that relief will be given. An unexpected outcome of the new regulations is that we are beginning to see success in getting programs such as the university nanosats to consider including extended follow-on amateur communication missions. By extended their expected mission many years beyond their initial science experiment, they can more easily meet the design goal of being out of orbit 25 years after the "end of mission".

Rick announced that he felt the time was overdue for AMSAT to file a petition with the FCC to amend their rules to provide an exception to the pecuniary interest prohibition against teachers and graduate students who command educational satellites. Rick and Bill Tynan will update and present the recommended filings for consideration.

3) Industry

No further information has been received from Intelsat regarding the potential for their hosting an AMSAT payload. For us to be taken seriously by these commercial entities we need to show that we either have our funding in place or at least know a path to acquire the funding. Noting that his local ham club had received funding for new gear from the Dept. of Homeland Security, Rick

pointed out that we have names to contact at DHS that we have not yet followed up on. Bill Ress suggested that we start that follow-up to determine if what we are proposing would in fact be of interest and to make adjustments to our plans accordingly. Even if the mission we could fly on ends up being as late as 2013, the time to begin working on funding is now. The money will be needed for hardware development and testing in addition to the actual integration and launch costs.

Operations Team Report, provided by Drew Glasbrenner

AO-7 is working well. The command team may try sending a few commands just before the next eclipse season starts. This way, if there is a problem, going into eclipse should reset the computer.

AO-16 is approaching the end of its final period of usability due to lower temperatures causing the spacecraft computer to continually reset. It will be several years before temperatures are expected to rise again.

AO-51 is back in full sun. Currently, both UHF transmitters are operating at ~750 mW. In full sun the power budget also allows operation of both UHF and S-Band downlinks simultaneously. Now that three command stations are available, software reloads can be done in a day. There may be upcoming opportunities for new volunteers to participate with the AO-51 Modes Committee. Many modes continue to be used and new modes tried, such as L-SSB/U-FM. The use of PL tone access for members only has been suggested. This is neither recommended nor supported by the VP-Operations. Jim Heck also advised caution about having a "members only" satellite service. Tom asked about reversing the polarity of the magnet. Gould advised that he wanted more information about controlling the magnet system before he attempts it. When asked about the magnet software, Jim White, WD0E, has indicated that software would have to be written. Drew expressed his reluctance to test new software while on orbit. However, he noted that we may eventually need to know how to maintain the polarity.

Tom advised that the ARRL has set up a microwave (902 MHz and up) band planning committee. Several members are also AMSAT members.

Doug Quagliana asked about improvements

to the PBBS software. It was noted that the lack of documentation on DMA switching and other items hinders new development.

Drew noted that he has used Graham Shirville, G3VZV's, station to check on AO-51 while it was over Europe. OZ7SAT has a telemetry server available. Access to data from stations in geographically diverse areas is very helpful and is appreciated by the Command Team.

Marketing and Sales Team Report, provided by Rick Hambly

Rick reported that the marketing team had had high hopes, but it did not get much accomplished. Steve Kenwolf of Kenwolf Design had been asked by Dan Briner, AB3EN, to evaluate the look and feel of the AMSAT logo and to suggest changes. Steve's initial response was not well received and that brought this effort to a halt. Barry talked to Dan, and while he does not want to be VP Marketing, he is willing to work on specific projects and deadlines. Martha observed that there is a serious need to review and update the in-house ads.

Tim Lilley, N3TL, who just recently made first satellite contact, was introduced to the board. He has an extensive background in marketing, public speaking and event planning. Tim explained some of the concepts behind branding and positioning and suggested that AMSAT needs branding. The development of an "AMSAT brand" needs to occur, not only within the amateur community but with the general public as well. Martha reminded that there is a need to review and update AMSAT's in-house advertisements.

As a result of Tim's efforts, Elk Antennas donated an antenna to award as a door prize at the Symposium. Yaesu contributed a certificate for a FT-60. With these two donations there will be a complete handheld satellite station available among the prizes.

User Services Team Report, provided by Gould Smith

AMSAT membership at the end of 2008 was 3745, down slightly from 3978 the previous year. The last year that AMSAT saw a net increase in membership was 2001; the year after AO-40 was launched and placed into operation.

User Services activities include *The AMSAT Journal*, AMSAT News Service (ANS), awards and contests, Field Operations, HF and VHF nets and support of AMSAT's activities at the Dayton Hamvention.



The *AMSAT Journal* continues to be AMSAT's flagship publication. Ed Long is doing a fine job as *Journal* editor, but a lack of submitted content has resulted in some issues being late. The due date for submissions is the 15th of odd-numbered months. With the goal of getting the *Journal* back onto a more consistent delivery schedule, Gould requested that each board member and officer contribute three articles during the upcoming year. Gould is also looking for volunteers to solicit articles as well as to write them.

ANS continues to do an excellent job of compiling and distributing the weekly bulletins. Currently we have three editors working each week in rotation. They are JoAnne Maenpaa, Dee Interdonato, and Lee McLamb.

The various AMSAT operating awards continue to show consistent popularity. Participation in the 2008 Field Day was up slightly, with increases in the number of satellites available, QSOs and stations reporting.

AMSAT nets were active on HF, VHF and via the Internet in 2008. The 20 meter net continues to meet at 1900 UTC on Sundays, thanks to W5IU, W7LB and AA6W. The Florida AMSAT Net meets Thursday evenings through linked repeaters and via EchoLink. The Houston AMSAT net also continues on Tuesday evenings. Work is underway to update the list of nets and make it available on the Web site.

Field Operations saw a slight increase in the number of Area Coordinators. Currently there are 182 people listed, although it's likely that some of them are no longer active. One of the goals for 2009 will be to verify and update the Area Coordinator list. Through the efforts of these volunteers, AMSAT was represented at 40 hamfests in 2008 and these generated \$11,333 in gross receipts. Goals for Field Operations in 2009 include:

- Increase AMSAT's presence at hamfests.
- Improve utility of the Field Ops Support System.
- Organize a list of skills and contacts.
- Increase the number of presentations and demonstrations.
- Recruit new Area Coordinators and reactivate those presently inactive.

Gould is seeking a person to serve as Director of Field Operations. This individual

would provide leadership for the Area Coordinators, handle administrative tasks associated with keeping the list of Area Coordinators up to date, help improve the materials available to the coordinators, send out Field Ops newsletters and write articles for the *Journal*.

AMSAT at the Dayton Hamvention in 2008

AMSAT had six booth spaces and an outside demonstration area. Part of the booth space was set up as an engineering area with times scheduled for attendees to have an opportunity to meet and talk with satellite developers. The booths also provided an opportunity to speak with AMSAT's officers and members of the board. Saturday morning was a new time for the AMSAT Forum. Gross income from Hamvention was \$26,671, higher than it had been in most recent years. Membership renewals received during Hamvention were also up in 2008. The combined AMSAT/TAPR banquet held on Friday night at the Presidential Banquet Center was a success. Recommendations to make this event even more successful in 2009 included engaging the guest speaker earlier and having the AMSAT Store operational to take banquet reservations. Goals for AMSAT's 2009 effort at Dayton include:

- Provide more information on the Web site.
- Schedule engineering mini-talks at the booth.
- Discuss with ARRL about having a satellite presentation in their area.
- Provide better engineering displays.
- Show more satellite demonstration equipment.

LVB Tracker Box Sales

Mike Young, WB8CXO, built and tested over 100 LVB tracker boxes in 2008. His efforts have resulted in a profit to AMSAT of more than \$7,000.

Engineering Team Report, provided by Rick Hambly

1) Lab Status

Rick reported that he had spent the previous day at the AMSAT lab with our lawyer. We have learned that our previous host there, the Hawk Institute for Space Sciences (HISS), is no longer a tax exempt 501c3 organization. All of our equipment at HISS remains in good condition, but we've been forced to file a lawsuit to regain access to it and to make arrangements for its removal. There

will likely be an additional filing with the court within weeks to recover our financial and moving expenses. Because it's likely that we will remove our equipment before a new home is found for the lab, a temporary storage facility will be needed. We have reached a tentative commitment with Bill Windsor to make space available for storage elsewhere. A new permanent location will require 1800-2000 square feet of floor space. We are currently involved in discussions with both Auburn and Cornell universities. John Klingelhoef, WB4LMN, has advised that Auburn is very interested in hosting the lab. Approximately 12,000 square feet of space has been identified as available and additional spaces are also being evaluated. Martha advised that we are still carrying liability insurance for AMSAT's materials at the present lab.

2) Eagle

Rick reported that he had disassembled the most recent engineering team and that while some team members have moved on to other AMSAT projects, others are still interested in participating with the team. There is uncertainty regarding exactly what needs to be engineered at this point. Rick stated that he would take on development of the Advanced Communications Payload (ACP) as a personal project and would inform us when he had working hardware to show.

3) AO-51

This satellite needs help from engineering personnel to update and develop software.

4) P3E

At this time AMSAT-NA has done all it can for this project. All the CanDo modules have been finished and delivered. IHU3 documentation has been archived and is hosted on the AMSAT Web site. Jim Heck reported that he has been in contact with Peter Gulzow, DB2OS and learned that AMSAT-DL will remain at their current location, although the cost has increased. AMSAT-DL is now renting directly from their landlord, no longer from the university. They continue to work with the German government agency DLB regarding funding for a launch. AMSAT-DL is also working now with another launch agency.

5) SuitSat-II

Rick has the software defined transponder (SDX) boards at his home lab. He's found many interface issues. He hopes to have the two boards talking to each other within the



next few weeks. Once that's done, the DSP heavy hitters can be brought in. Larry Gas has offered to fix the SDX code and Frank Brickley, AB2KT, says he has 80-100 hours available to contribute for the remainder of this year.

International Trafficking and Arms Regulations (ITAR) and Technical Assistance Agreements (TAA), an update provided by Rick Hambly

Rick reported that TAA between AMSAT-NA, -UK and -DL have been drafted for review. These TAA include the "boiler plate" clauses required by the Department of State. One of these in particular (para 5) makes it unlikely that it will ever be signed by our overseas partners because it will effectively put members of AMSATs in other countries under ITAR jurisdiction. This is having a significant impact on our international relations.

Bill Ress opined that based on experience with his personal business, we might better come under the Commerce Department's Export Arms Regulations (EAR). Through EAR, AMSAT could request a Commodity Jurisdiction Adjudication (CJA). If we pursue a CJA it will need to cover both hardware and software. Barry noted that as part of this process we must come to grips with our past history because P3D, MOST and P3E were done after ITAR was enacted.

Some of our members have had direct experience in dealing with ITAR issues and they have provided contact information concerning lawyers with whom they worked. Whatever path is eventually used to resolve this issue, the results must be sufficiently ironclad so that our volunteers can feel exempt from prosecution while donating their efforts to AMSAT.

Lou McFadin noted that ITAR was having an impact on the ARISS program. NASA will not ship the SuitSat-II IHU because it's a Russian experiment. This means that we will now need an export license.

AMSAT's Mission and Vision, Discussion led by Barry Baines

The current status of our rideshare efforts with Intelsat was questioned. John Klingehoffer observed that without funding we have no entry to Intelsat. Drew suggested that as an alternative we look for other satellite platforms in a geostationary orbit that could host us, perhaps government-sponsored. Bill Tynan suggested that we partner with the ARRL on this. Lee stated that we don't

have time to sit idle. Even if the launch opportunity in 2011 doesn't work out and the next is in 2013, we need to start getting funding together now. Martha recommended establishing a committee to pursue the funding question and to determine the reality of raising \$6-8 million.

Bill Ress agreed that in the meantime we can't sit idle and we may need to return to LEO projects plus developing modular communication systems that will work in LEO and can be expanded for use in higher orbits. Hopefully, these new projects will be enticing for a new generation of builders. Bill Ress and Martha observed that there is a lot of talent available on the West Coast. Bill Ress has made many potentially useful contacts within the microwave societies. Barry may need to schedule a visit to California. Graham Shirville suggested recruiting from Cubesat teams. Rick commented that most schools doing satellite projects are in the aeronautical area, not electrical and that they have a need for communication systems to meet the requirements of university satellite builders. Bill Ress suggested establishing a small-concept task force to develop a modular framework to support a near-term satellite opportunity. He offered to lead the task force with Drew and Lou also volunteering to serve. One additional member will be identified later. Drew noted that one of the key objectives should be the ability to respond to short notice launch opportunities.

Once the desired modules are defined, AMSAT could make the specifications known and encourage students and schools to take on their design as Senior Design or Capstone projects. Another method of generating interest could be through a student design competition geared toward providing the modules we need.

Drew also noted that we have had a standing offer for the past two years to provide a test location willing to host an experimental SDX system located in Florida 800 feet above ground.

Review of the AMSAT Vision Statement

Lee reminded that our "Our Vision is to deploy high earth orbit satellite systems with the goal of providing continuous coverage." Drew made a motion to amend our Vision Statement to read "Our Vision is to deploy satellite systems with the goal of providing wide-area and continuous coverage". The motion was seconded by Rick and it was

approved by a unanimous vote.

Report from "The Continent" to "The Colonies" provided by Jim Heck

Jim reported that AMSAT-UK membership has remained relatively stable. As noted earlier in the discussion regarding ITAR, the ITAR-TAA boilerplate paragraph 5 is unacceptable.

Graham Shirville advised that ARISS is providing V/U antennas for installation outside the European Columbus module of the ISS. AMSAT-UK extended their best wishes to Barry Baines upon becoming the new AMSAT-NA president.

Things That AMSAT Could Do to Increase its Visibility and Attractiveness to New Hams, Presented by Tim Lilley

Tim noted that AMSAT membership numbers represent < 6/10 of 1% of the Amateur Radio community. He provided background information about marketing and branding, along with several suggestions concerning development of an AMSAT podcast and a constructing a marketing slogan such as "Keeping Amateur Radio in Space". Pat Kilroy volunteered to work with Tim to develop support for high altitude ballooning activities within AMSAT. Some of Pat's suggestions included publishing a High Altitude Experimenter's Handbook and creating YouTube AMSAT videos. Tom Clark reminded everyone that AMSAT had an active balloon program in the 1980s. Gunther was asked if Tim would accept the position of VP Marketing to which Tim replied "yes". He added "however he's not seeking a title, he's just willing to do the work".

The meeting adjourned for the day at 9:00 p.m. EST. It reconvened the following day at 8:00 a.m. EDT with President Baines presiding.

Closed Session - Open to Board Members and Invited Guests Only

A closed session was held to deal with administrative matters including Martha Saragovitz's performance review and compensation. No record was made of this session. The session was closed and the open meeting was called to order at 9:16 a.m. EDT.

Finalizing the Budget

Gunther Meisse moved to accept the budget as presented the previous day and modified during the closed session. The motion was seconded by Barry Baines and it was



approved by a unanimous vote.

Selection of a Location for the 2009 Annual General Meeting and Space Symposium to Celebrate AMSAT's 40th Anniversary

Rick Hambly opined that the past few Annual Meetings have been work-intensive for everyone involved, both the office staff and local volunteers. He suggested having only two recurring, alternating locations. Martha disagreed, expressing the opinion that it is better to have the meeting move around the country. Tim suggested getting bids from various economic councils. In the event no bids are received, we can continue as we do now. Tom Clark commented that in the past, the TAPR, W9DXCC and the Central States VHF Society have held their meetings in the Chicago area. He noted that Central States tries to plan its meetings two years in advance.

For 2009, Martha volunteered to assemble a group of volunteers to hold the meeting in the Baltimore-Washington area, near the Baltimore-Washington International Thurgood Marshall Airport. She offered that the accommodations there may not be fancy, but it's easily accessible to air travelers and it's relatively inexpensive. Pat Kilroy commented that that the DC area Historical Electronics Museum is nearby and its Pioneer Hall could accommodate a group our size. Pat added that the annual dinner could be held at the Goddard Space Flight Center (GSFC) recreational center. He added that the cost to make a reservation there is only \$50.

Summary of Board Actions at the August 2008 Planning Meeting Held at the Baltimore-Washington International Airport

1) Must do during 2008

- Deliver the IHU-3. Rick is still willing to pursue completing this task
- Complete the AMSAT Information Management System (AIMS).
- Recruit a new Web master. Barry is working on this item.
- Update the Satellite page on the Web site. Drew been working on this.

2) Low Fruit (easily completed tasks)

- Finish setting up the OpenKM server for file sharing.
- Improve interactions between the senior officers and among team members.
- Update the list of AMSAT VHF nets.

Atta-boys and Atta-girls

The following persons, in addition to those mentioned in the text, were recognized for their contributions to AMSAT:

Jim, Brad and Nancy Jaejer, K8RQ, and Kevin Duran for forming the AMSAT.ORG team in the Rolex Dayton prototype sports car series.

Special thanks to Bob McGuire, N4HY, Michelle Thompson, W5NYV, and Matt Ettus, N2MJI, for their work on the ACP project.

The entire Microchip Team, especially Steve Bible, Joe Julicher, Jerry Zdenek, John Charais and Tim Moffat

Dan Shultz, N8FGV, for once again pulling together the 2006 and 2007 *Proceedings*

The HPSDR Team for their work that contributes toward software defined transponders

To Phil Harmon, VK6APH, for presenting a very interesting and enlightening talk on software defined radios

Those on the ARISS teleconference list:

Mike Young, WB8SCO, for his work on the LVB tracker box project

Drew Glasbrenner, KO4MA, and Mark Hammond, N8MH, for their work recovering AO-16

Jim White, WD0E, and Bruce Rahn, WB9ANQ, for mentoring

Gould Smith, WA4SXM, for being the command station that responds to many requests

Kevin Schuchmann, WA6FWF, for providing a much needed command station capability on the West Coast

The AO-51 Modes committee for their support in scheduling AO-51 activities throughout the year.

Robert Davies, KI4HXT, Cameron Badgett, K4ACB, and Dave Jordon, AA4KN, acting as FL-AMSAT net control

The ARISS Team for support of the Richard Garriott flight

Mark Severance for support of new ARISS antennas

Frank Bauer, KA3HDO, for his ongoing great support of ARISS

Adjournment

Gould Smith made a motion that the meeting be adjourned. It passed by a unanimous vote at 11:27 a.m. EDT and the meeting was declared adjourned. ☺

- Use the phone. Most officers and BoD members do not have unlisted phone numbers, so look up their phone number on the Web and call at a reasonable hour taking into account the time zone of the person you're calling.

I hope that these observations about how best to communicate with the AMSAT leadership will encourage helpful and positive interaction within the organization.

AMSAT Symposium

The AMSAT Symposium is quickly approaching. Symposium Chairman Frank Bauer, KA3HDO, and his crew are working hard to organize an outstanding event for us. This year marks the 40th anniversary of AMSAT and we intend to celebrate during the Symposium. Along with an AMSAT birthday party get together for AMSAT members on Friday evening, we are publishing a history of AMSAT compiled by Bill Tynan, W3XO, which will be released at the Symposium and will be included in the registration packet (and available for sale following Symposium). All of the former AMSAT presidents have been invited to the celebration as well as key individuals who were involved with AMSAT's early days. In addition, we expect a number of excellent papers to be presented.

Please join us at the BWI Sheraton as we reflect on AMSAT's significant history of accomplishments and we look forward toward another 40 years of Amateur Radio in space. I fully expect that you will hear some good news on AMSAT's future direction. You may register for the AMSAT Symposium via the AMSAT store and there is hotel reservation information available as well.

I look forward to seeing everyone at the BWI Sheraton!

73,

Barry A. Baines, WD4ASW

President ☺



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